



ಕರ್ನಾಟಕ ಸರ್ಕಾರ

GOVERNMENT OF KARNATAKA

ಕಾಲೇಜು ಮತ್ತು ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ

DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

**C-20
2020-21**

Diploma in Mechanical Engineering



With Effect from 2020-21

C-20

**Curriculum Development
Cell**

**Department of Collegiate &
Technical Education**

Vision




[(To be drafted individually at institution level)]

To be a premier department for education in Mechanical Engineering in Karnataka State, moulding students into professional diplomats with ethical values as per the need of stake holders

Mission

(To be drafted individually at institution level)

(The mission of the Mechanical Engineering Program is to benefit the society at large by)

-  **M1:** To provide teaching/learning facilities in Mechanical Engineering for easy adaptation to industry and higher learning
-  **M2:** Provide a platform for self-learning to meet the challenges of changing technology and inculcate Ethical values, team spirit and leadership qualities to succeed in professional career.
-  **M3:** Comprehend the societal needs and environmental concerns in the field of Mechanical engineering

Programme Educational Objectives (PEOs)

(To be drafted individually at institution level)

(After 2/3 years of graduation, the students will have the ability to)

1. Analyze, design and solve problems related to Mechanical Engineering and adapt to changes in technology by self-learning.
2. Work effectively as individuals and in a team, exhibiting leadership qualities to meet the goals of a project or the organization.
3. Work with professionalism and concern for environment to meet the societal needs.
4. Engage in higher learning leading to degrees or certifications.

PROGRAM OUTCOMES (POs)

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes.

CONSISTENCY MATRIX OF PEO'S WITH MISSION

	PEO statements	Adapt to Industry	Higher Learning	Team Spirit	Self-Learning	Leadership Qualities	Societal Needs	Environmental Concern
1	Analyze, design and solve problems related to Mechanical Engineering and adapt to changes in technology by self-learning	3	3		3			
2	Work effectively as individuals and in a team, exhibiting leadership qualities to meet the goals of a project or the organization			3	3			
3	Work with professionalism and concern for environment to meet the societal needs						3	3
4	Engage in higher learning leading to degrees or certifications	3	3					

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program shall specify 2-4 Program Specific Outcomes
(To be drafted individually at institution level)

1. Apply concepts in core areas of Mechanical engineering – Hydraulics and fluid power, management Systems, Mechanics of machines and thermal Engineering to solve technical issues.
2. Develop and optimize solutions in Computer aided manufacturing platforms.

1.0 GENERAL PROGRAMME STRUCTURE AND CREDIT DISTRIBUTION

1. **Definition of Credit:** Credit is a kind of weightage given to the contact hours to teach the prescribed syllabus, which is in a modular form. For courses, one credit is allocated to one contact hour for theory / tutorial per week and one credit is allocated to 02 contact hours for practical.
2. **Choice-Based Credit System (CBCS):** CBCS is a flexible system of learning that permits students to learn at their own pace, choose electives from a wide range of elective courses and adopt an inter-disciplinary approach in learning and make best use of the expertise of available faculty.

3. Range of Credits

1 Hr. Lecture (L) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
1 Hr. Tutorial (T) per week	1 credit
4 Hrs. Theory (T) per week	4 credit
3 Hrs. Practical (P) per week [1 Hr. Tutorial +2 Hrs. Practical]	2 credit

4. **Programme:** Programme means Diploma Programme that is Diploma in Mechanical Engineering, which is of three years duration.

2.0 PROGRAMME STRUCTURE

1. **Course:** A Course is a component (a paper) of a Programme. All the courses need not carry same weightage. The course should define Course objectives. A course may be designed to involve lectures / tutorials / laboratory work / seminar / project work/ Internships / seminar or a combination of these, to meet effectively the teaching and learning needs and the credits may be assigned suitably.
2. **Course Code:** Each course shall have an alphanumeric code, which includes last two digits of year of introduction such as 20 subject code ME (ME for Mechanical engineering, CH for Chemical Engineering etc.), then first two digits for example 12 (where 1 represents first semester and 2 represents the course number in incremental order) and the last alphabet represent Theory (T), Practical/Internship/Project (P), Drawing (D), Programme / Open Electives (A, B, C, E, F, G ...).
3. **Programme Courses:** Each Programme will consist of Communication skills and Social Sciences (HS), Engineering Mathematics, Statistics and Analytics (BS), Engineering Sciences (ES), Professional Core (PC), Professional Electives (PE), Open Electives (OE), Employability Enhancement Courses (EEC) and Internships.
 1. **Communication Skills and Social Sciences:** Communication Skills and Social Science courses are incorporated in the curriculum to meet the desired needs of communication and life skills amongst students.
 2. **Engineering Mathematics, Statistics and Analytics:** Common to all Engineering Programme to develop reasoning and analytical skills amongst students.
 3. **Engineering Sciences:** Engineering Science shall create awareness on different specializations of engineering studies. The goal of these courses are to create engineers of tomorrow, who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect. It could be any branch of engineering - Civil, Computer Science and Engineering, Electrical, Mechanical, etc.

4. **Professional Core:** Core Courses designed in the programme which are major courses of the discipline, required to attain desired outcomes and to ignite critical thinking skills amongst students.
5. **Professional Elective:** Generally, a course can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline or nurtures the candidate's proficiency/skill is called Professional Elective Course.
6. **Open Electives:** An elective course chosen generally from other discipline/ subject, with an intention to seek interdisciplinary exposure is called an open elective. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents of which are similar to that of their departmental core/elective courses.
7. **Audit / Non-Core Courses:** An audit / Non-core course is one in which the student attends classes, does the necessary assignments, and takes exams. The Institute encourages students towards extra learning by auditing for additional number of courses. The results of audit courses shall not be considered for prescribed "carry over courses" limit, however students need to pass audit courses for awarding the diploma.
8. **Employability Enhancement Courses:** It contains the following courses:
 - a. **Mini Project:** Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by development of small systems/application.
 - b. **Seminar:** Seminar should be based on thrust areas in state of art technologies. Students should identify the topic of seminar and finalize in consultation with Guide. Students should understand the topic and compile the report in standard format and present in front of Panel of Examiners respective Programme.
 - c. **Major Project:** Every student must do one major project in the Final year of their program. The minimum duration of project is 6 months. Students can do their major project in Industry or R&D Lab or in house or combination of any two.

3.0 COURSE CODE AND DEFINITION:

Cours e code	Definitions	Teaching Dept. Code	Name of the Teaching Department	Teaching Dept. Code	Name of the Teaching Department
L	Lecture	SC	Science	MI	Mechanical Engineering [Instrumentation]
T	Tutorial	CP	Commercial Practice / English	CR	Ceramic Engineering
P	Practical	ME	Mechanical Engineering	EN	Civil Environmental Engg.
HS	Humanities & Social Sciences Courses	EE	Electrical & Electronics Engg.	AN	Aeronautical Engg.
BS	Basic Science Courses	CE	Civil Engineering	MN	Mining & Mine Surveying
ES	Engineering Science Courses	EC	Electronics & Commn. Engg.	MM	Modern Office Management
PC	Program Core Courses	CS	Comp Science & Engg.	LI	Library and Information Science
PE	Program Elective Courses	IS	Info Science & Engg.	FT	Apparel Design and Fabrication Technology
OE	Open Elective Courses	AT	Automobile Engg.	CH	Chemical Engineering
AU	Audit Courses	MC	Mechatronics	PO	Polymer Technology
SI	Summer Internship	MT	Metallurgical Engg.	PT	Printing Technology
PR	Project	HP	Mechanical Engineering [HPT]	TX	Textile Technology
SE	Seminar	WS	Mechanical Engineering [Welding & Sheet Metal]	EI	Electronic Instrumentation & Control Engg.
CIE	Continuous Internal Evaluation	CN	Cinematography	LT	Leather & Fashion Technology
SEE	Semester End Examination	SR	Sound Recording & Engg.	WH	Water Technology & Health Science
		PH	Civil (Public Health & Environment) Engg.	MY	Mechanical Engineering [Machine Tools]
		TD	Tool & Die Making	AR	Architecture
		ID	Interior Decoration	EG	English

4.0 INDUCTION PROGRAMME

The Essence and Details of Induction program can also be understood from the “Detailed Guide on Student Induction program”, as available on AICTE Portal, although that is for Diploma students of Engineering & Technology. Suggestive schedule for induction program is given below

(Link: <https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>)

Induction Program Schedule (Suggestive only)*(Induction program for students to be offered right at the start of the first year)*

SL NO	DAY	TIME	ACTIVITY	VENUE
1	1	09.30-12.30	Registration, Formation of Mentor-mentee groups – Introduction of mentors with-in group.	Classrooms of respective programs
		01.30-04.30	Screening of Institute video clips of various functions held and Photos of various events, Institution Excursion	Seminar hall
2	2	09.30-12.30	Prayer- Physical activities such as yoga; Presentation cum Interactive Session with: Important Institution Functionaries like Principal, HOD's etc.	Playground and seminar hall
		01.30-04.30	Visit to Central facilities such as Reading room, library, Sport center, computer center, hostel, NSS/NCC cell, community development cell functioning in polytechnic	Tour
		01.30-04.30	Lecturer sessions about importance of NSS/NCC/Youth red cross activities and their contribution towards national building and personality and character development	Seminar hall
4	4	09.30-12.30	Personality development talk on Human values	Seminar hall
		01.30-04.30	Interaction with Alumni students of polytechnic of different programs and interaction with few alumina and sharing their experiences	Seminar hall
5	5	09.30-12.30	Introduction to Swatch Bharath Abhiyan-Importance of Abhiyan-Clean drive in around college	Campus
		01.30-04.30	Talent hunt-Music/Antyakshri/Instrument play/ Dance/Team Activity	College Auditorium
6	6	09.30-12.30	Talent hunt Activity: Essay/Debate/Best out of Waste/Pick and speak, other	Seminar hall
		01.30-04.30	Screening of Movie related: personality development, character building, motivational, Environmental concern, Public health, rural sanitation	College Auditorium
7	7	09.30-12.30	Exchange of views between students and faculty about their Institute/program/carrier opportunities	Seminar hall
		01.30-04.30	Games/Sports Activity	Sports ground
8	8	09.30-12.30	Talk by training and placement cell: Carrier opportunities for diploma students, placement activities in college; placement process	Training and placement cell
		01.30-04.30	Talents hunt Activity: (Street Play/Mime/Acting/Stand Up Comedy /Dance etc.)	Seminar hall
9	9	09.30-12.30	Personality development talks by eminent speakers on - Leadership styles/How to handle failures/stress management	Seminar hall
		01.30-04.30	Importance of student union, student union activities, Student insurance, how to make student insurance by Student welfare officer of college	Seminar hall

10	10	09.30-12.30	Awareness on: Student scholarship- introduction to SSP portal – e-pass portal-Authenticated documents, how to apply in portal: Talk by Taluk/District social welfare officer	Seminar hall
		01.30-04.30	Local visits to surrounding places/Industry	Tour
11	11	09.30-12.30	Talk on Respective Program scheme of studies and detail of courses, Diploma examination pattern, Passing and eligibility criteria, attendance requirements by respective program coordinator	Department Classrooms
		01.30-04.30	Visit to respective programs lab/workshops of institution	Tour
12	12	09.30-12.30	Awareness camp on human health, Community health, Personal hygiene-By Local Taluk medical officer/Community medical officer	Seminar hall
		01.30-04.30	Collection of student feedback on induction program- Make a report Valedictory of two weeks Induction program by collecting student feed back	Seminar hall

Induction Program (mandatory)	Two- week Duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> Physical activity Creative arts Universal human values Literacy Proficiency modules Lectures by Eminent People Visits to Local Areas Familiarization to Dept./Branch & Innovations

5.0 MANDATORY VISITS/WORKSHOP/EXPERT LECTURES:

1. It is mandatory to arrange one industrial visit every semester for the students of each branch.
2. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
3. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

6.0 EVALUATION SCHEME:

A. For Theory Courses:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded

B. For Practical Courses:

The weightage of Continuous Internal Evaluation (CIE) is 60% and for Semester End Exam (SEE) is 40%. The student has to obtain minimum of 40% marks individually both CIE and SEE to pass. The

practical Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration exams). Based on this grading will be awarded.

C. For Summer Internship / Projects / Seminar etc.

1. Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note:

- A. The Continuous Internal Evaluation (CIE) is based on the student's performance in Internal Assessment tests, student activity, mini project, quizzes, assignments, seminars, viva-voce in practical, lab record etc. as specified in respective course curriculum.
- B. **Major Project/Mini Project:** Students can do their major project in Industry or R&D Labor in house. Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by development of small systems/application.
- C. **Personality and character development:** It is mandatory for the students from 1st semester to enroll in any one of the personality and character development programmes (NCC/NSS/YRC/Yoga/Technical Club) and undergo training for their Personality and character development.
 - National Cadet Corps (NCC).
 - National Service Scheme (NSS) will have social service activities in and around the Institution.
 - Youth Red Cross (YRC) will have activities in and around the institution.
 - Yoga
 - Technical Clubs.
- D. **Internship:** A minimum of 10 credits (400 Hours) of Internship/ Entrepreneurial activities / Project work/ Seminar and Inter/ Intra Institutional Training may be counted toward three-year diploma programme.
- E. **Mapping of Marks to Grades:** Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Level	Assigned Grade	Grade Point
91-100	Outstanding	A+	10
81-90	Excellent	A	09
71-80	Very Good	B+	08
61-70	Good	B	07
51-60	Above Average	C+	06
45-50	Average	C	05
40-44	Satisfactory	D	04
<40	Fail	F	00
Fail due to shortage of attendance and therefore, to repeat the course/semester.		F*	00
Fail in Continuous internal Evaluation (CIE).		F**	00

Note: Those Candidates who have not obtained requisite minimum pass marks in CIE are not eligible to take up SEE in that course until they get requisite minimum pass marks in the CIE. They may re- register for the CIE in the subsequent regular semesters by paying prescribed examination fee.

SGPA and CGPA Calculations

Semester Grade Point Average (SGPA)=	$\frac{\sum[(\text{Course Credits earned}) \times (\text{Grade Points})] \text{ for all the courses in that semester}}{\sum[\text{Total Course credits applied}] \text{ for all the courses in that semester}}$
Cumulative Grade Point Average(CGPA)=	$\frac{\sum[(\text{Course Credits earned}) \times (\text{Grade Points})] \text{ for all courses, excluding those with F*/F** grades until that semester}}{\sum[\text{Total Course Credits earned}] \text{ for all Courses excluding those with F*/F** grades until that semester}}$
Note: The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the semester Diploma marks /grade card.	

A. SGPA and CGPA Calculations: An illustrative example for one academic year

Semest er	Course Code	Credits Applied (CA)	Result Grade	Grade Points (GP)	Credits Earned (CE)	Credit points (CP=CE x GP)	SGPA, CGPA	
I	Course 1	4	B	7	4	4x7=28	SGPA=CP/CA =110/22 = 5.00	
I	Course 2	4	F	0	0	0x0=00		
I	Course 3	4	Absent (F)	0	0	0x0=00		
I	Course 4	4	A	9	4	4x9=36		
I	Course 5	2	A+	10	2	2x10=20		
I	Course 6	2	D	4	2	2x4=08		
I	Course 7	2	A	9	2	2x9=18		
	Total	22			14	110	SGPA = 5.00	
Note: In 1 ^s semester grade/marks card only SGPA is reported. From 2 ^d semester onwards both SGPA & CGPA will be reported in the grade/marks card.								
Semest er	Course Code	Credits Applied (CA)	Result Grade	Grade Points (GP)	Credits Earned (CE)	Credit points (CP=CE x GP)	SGPA, CGPA	
II	Course 1	4	B	7	4	4x7=28	SGPA=CP/CA =100/19 = 5.26	
II	Course 2	4	A	9	4	4x9=36		
II	Course 3	3	D	4	3	3x4=12		
II	Course 4	3	Absent (F)	0	0	0x0=00		
II	Course 5	2	A+	10	2	2x10=20	CGPA = CP/CE =(110+136)/ (14+22) = 246/36 =6.83	
II	Course 6	1	D	4	1	1x4=04		
II	Course 7	2	F	0	0	0x0=00		
		19			14	100		
I Semester Back log courses								
I	Course 2	4	C	5	4	4x5=20		
I	Course 3	4	D	4	4	4x4=16		
	Total	27			22	136		

- Total credits of the semester excluding the credits of the courses under F/F*/F** grade are considered for the calculation of CGPA of the two consecutive semesters under consideration.

B. CGPA Calculation of the entire programme: An Illustrative Example.

Semester	I	II	III	IV	V	VI	Total
Credits of the Semester	22	19	24	24	24	24	137
$\sum CP$	110	136	184	155	191	188	964

$$CGPA = \frac{[110+136+184+155+191+188]}{22+19+22+24+24+24} = \frac{964}{137} = 7.04$$

P=Percentage Conversion= (CGPA-0.75) X 10

Class Declaration:

After the conversion of final CGPA into percentage of marks (P), a graduating student is declared to have passed in:

- (i) First Class with Distinction (FCD) if $P \geq 70\%$
- (ii) First Class (FC) if $P \geq 60\%$ but $<70\%$ and
- (iii) Second Class (SC) if $P < 60\%$.

**SCHEME OF STUDIES
DIPLOMA IN MECHANICAL
ENGINEERING
(C-20)**

CURRICULUM STRUCTURE

I Semester Scheme of Studies - Diploma in Mechanical Engineering [C-20]

S. N	Course Category / Teaching Department	Course Code	Course Title	Hours per week			Total contact hrs /week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE)	Assigned Grade	Grade Point	SGPA and CGPA	
				L	T	P			Max	Min	Max	Min						
THEORY COURSES																		
1	BS/SC	20SC01T	Engineering Mathematics	4	0	0	4	4	50	20	50	20	100	40			Only SGPA for 1 st Semester	
2	ES/ME	20ME11T	Materials for Engineering	4	0	0	4	4	50	20	50	20	100	40				
PRACTICAL COURSES																		
3	EG/SC/ME	20EG01P	Communication Skills	2	0	4	6	4	60	24	40	16	100	40				
4	ES/ME	20ME12P	Computer Aided Engineering Drawing	2	0	4	6	4	60	24	40	16	100	40				
AUDIT COURSES																		
5	AU/SC	20AU01T	Environment Sustainability	2	0	0	2	2	50	20	-	-	50	20				
6	AU Physical Activity		Sports/NCC/NSS/Youth Red Cross/Yoga/ Technical club.	Student shall enrol in any one of these activities in 1 st semester and shall participate actively. The student shall obtain ‘Participation Certificate’ in the activity to get eligible for the award of Diploma.														
Total				14	0	8	22	18	270	108	180	72	450	180				

T: - Theory P: -Practical D: -Drawing E: - Elective BS- Basic Science: ES-Engineering Science: HS-Humanities & Social Science: AU-Audit Course:: EG: English ::SC: Science

Note:

- Assigned Grade, Grade Point, SGPA and CGPA to be recorded in the Grade/Marks card.
- AU- Physical Activity- Student participation in the selected physical activity shall be monitored and the participation record shall be maintained by the respective Programme Coordinator (Head of Section).
- Theory course Semester End Examination (SEE) is conducted for 100 marks (3 Hours duration)
- Practical course CIE and SEE is conducted for 100 marks (3 Hours duration)

II Semester Scheme of Studies - Diploma in Mechanical Engineering [C-20]

Sl. No	Course Category / Teaching Department	Course Code	Course Title	Hours per week			Total contact hrs/week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE marks)	Assigned Grade	Grade Point	SGPA and CGPA	
				L	T	P			Max	Min	Max	Min						
THEORY COURSES																		
1	SC/ME	20PM01T	Project Management Skills	2	0	4	6	4	50	20	50	20	100	40			SGPA & CGPA of 2 nd Semester	
PRACTICAL COURSES																		
2	BS/SC	20SC02P	Statistics and Analytics	2	0	4	6	4	60	24	40	16	100	40				
3	ES/EE	20EE01P	Fundamentals of Electrical & Electronics Engineering	2	0	4	6	4	60	24	40	16	100	40				
4	ES/CS	20CS01P	IT Skills	2	0	4	6	4	60	24	40	16	100	40				
5	ES/ME	20ME21P	Mechanical workshop Practice-1	2	0	4	6	4	60	24	40	16	100	40				
AUDIT COURSES																		
6	AU/KA	20KA21T	Kannada-I/ಸಾಹಿತ್ಯಸಿಂಚನ - I /ಬಳಕೆ ಕನ್ನಡ - I	2	0	0	2	2	50	20	-	-	50	20				
Total				12	0	20	32	22	340	136	210	84	550	220				

T:- Theory P:- Practical D:- Drawing E:- Elective BS- Basic Science:: ES-Engineering Science:: HS-Humanities & Social Science:: AU-Audit Course:: EG: English ::SC: Science
KA: Kannada

Note:

1. Assigned Grade, Grade Point, SGPA and CGPA to be recorded in the Grade/Marks card.
2. Theory course Semester End Examination (SEE) is conducted for 100 marks (3 Hours duration)
3. Practical course CIE and SEE is conducted for 100 marks (3 Hours duration)

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20SC01T	Semester	I/II
Course Title	ENGINEERING MATHEMATICS	Course Group	Core
No. of Credits	4	Type of Course	Lecture
Course Category	Theory	Total Contact Hours	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	10 Level Mathematics	Teaching Scheme	(L:T:P) = 4:0:0
CIE Marks	50	SEE Marks	50

RATIONALE

Engineering Mathematics specification provides students with access to important mathematical ideas to develop the mathematical knowledge and skills that they will draw on in their personal and work lives. The course enable students to develop mathematical conceptualization, inquiry, reasoning, and communication skills and the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts. At this level, the mathematics curriculum further integrates the three content areas taught in the higher grades into three main learning areas: Algebra; Measurement of angles and Trigonometry and Calculus.

1. COURSE SKILL SET

Student will be able to:

1. Solve system of linear equations arise in different engineering fields
2. Incorporate the knowledge of calculus to support their concurrent and subsequent engineering studies
3. Adept at solving quantitative problems
4. Ability to understand both concrete and abstract problems
5. Proficient in communicating mathematical ideas
6. Detail-oriented

2. COURSE OUT COMES

At the end of the course, student will be able to

CO1	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.
CO2	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.
CO3	Calculate trigonometric ratios of allied angles and compound angles. Transform sum or difference of trigonometric ratios into product and vice versa.

CO4	Differentiate various continuous functions and apply the concept in real life situations.
CO5	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

UNIT NO	UNIT TITLE	TEACHING HOURS	DISTRIBUTION (THEORY)			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
1	Matrices and Determinants	10	8	20	12	40
2	Straight lines	10	8	20	12	40
3	Trigonometry	10	8	20	12	40
4	Differential Calculus and applications	11	8	20	12	40
5	Integral Calculus and applications	11	8	20	12	40
	Total	52	40	100	60	200

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

4. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 MATRICES AND DETERMINANTS	➤ Use algebraic skills which are essential for the study of systems of linear equations, matrix algebra and eigen values	1.1 Matrix and types 1.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication) 1.3 Evaluation of determinants of a square matrix of order 2 and 3. Singular matrices 1.4 Cramer's rule for solving system of linear equations involving 2 and 3 variables 1.5 Adjoint and Inverse of the non-singular matrices of order 2 and 3 1.6 Characteristic equation and Eigen values of a square matrix of order 2	10-0-0

UNIT-2 STRAIGHT LINES	<ul style="list-style-type: none"> ➤ Able to find the equation of a straight line in different forms ➤ Determine whether the lines are parallel or perpendicular 	2.1 Slope of a straight line 2.2 Intercepts of a straight line 2.3 Intercept form of a straight line 2.4 Slope-intercept form of a straight line 2.5 Slope-point form of a straight line 2.6 Two-point form of a straight line 2.7 General form of a straight line 2.8 Angle between two lines and conditions for lines to be parallel and perpendicular 2.9 Equation of a straight line parallel to the given line 2.10 Equation of a straight line perpendicular to the given line	10-0-0
UNIT-3 TRIGONOMETRY	<ul style="list-style-type: none"> ➤ Use basic trigonometric skills in finding the trigonometric ratios of allied and compound angles ➤ Able to find all the measurable dimensions of a triangle 	3.1 Concept of angles, their measurement, Radian measure and related conversions. 3.2 Signs of trigonometric ratios in different quadrants (ASTC rule) 3.3 Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^\circ \pm \theta$, $180^\circ \pm \theta$, $270^\circ \pm \theta$ and $360^\circ \pm \theta$) 3.4 Trigonometric ratios of compound angles (without proof) 3.5 Trigonometric ratios of multiple angles 3.6 Transformation formulae	10-0-0
UNIT-4 DIFFERENTIAL CALCULUS AND APPLICATIONS	<ul style="list-style-type: none"> ➤ Able to differentiate algebraic, exponential, trigonometric, logarithmic and composite functions ➤ Able to find higher order derivatives ➤ Understand and work with derivatives as rates of change in mathematical models ➤ Find local maxima and minima of a function 	4.1 Derivatives of continuous functions in an interval (List of formulae) 4.2 Rules of differentiation 4.3 Successive differentiation (up to second order) 4.4 Applications of differentiation	11-0-0
UNIT-5 INTEGRAL CALCULUS AND APPLICATIONS	<ul style="list-style-type: none"> ➤ Understand the basic rules of integration and Evaluate integrals with basic integrands. ➤ Identify the methods to evaluate integrands ➤ Apply the skills to evaluate integrals representing areas and volumes 	5.1 List of standard integrals and Basic rules of integration 5.2 Evaluation of integrals of simple function and their combination 5.3 Methods of integration 5.4 Concept of definite integrals 5.5 Applications of definite integrals	11-0-0

5. MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	UNIT Linked	CL R/U/A	Theory in Hrs	TOTAL
C01	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.	1, 7	1	R/U/A	10	40
C02	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.	1, 7	2	R/U/A	10	40
C03	Calculate trigonometric ratios of allied angles and compound angles. Transform sum (difference) of trigonometric ratios into product and vice versa.	1, 7	3	R/U/A	10	40
C04	Differentiate various continuous functions and apply the concept in real life situations.	1, 3, 7	4	R/U/A	11	40
C05	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.	1, 3, 7	5	R/U/A	11	40
					52	200

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
ENGINEERING MATHEMATICS	C01	3	1	0	0	0	0	3
	C02	3	1	0	0	0	0	3
	C03	3	1	0	0	0	0	3
	C04	3	1	3	0	0	0	3
	C05	3	1	3	0	0	0	3
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

7. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.
2. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes.
3. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Ten minutes a day in homeroom, at the end of class, or as a station in a series of math activities will help students build speed and confidence.
5. Topics will be introduced in a multiple representation.
6. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

8. SUGGESTED LEARNING RESOURCES:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi, 40th Edition, 2007
2	G. B. Thomas, R. L. Finney	Calculus and Analytic Geometry	Addison Wesley, 9th Edition, 1995
3	S.S. Sabharwal, Sunita Jain, Eagle Parkashan	Applied Mathematics, Vol. I & II	Jalandhar.
4	Comprehensive Mathematics	Comprehensive Mathematics Vol. I & II	Laxmi Publications, Delhi
5	Reena Garg & Chandrika Prasad	Advanced Engineering Mathematics	Khanna Publishing House, New Delhi

9. COURSE ASSESSMENT AND EVALUATION CHART

Sl.No.	Assessment	Duration	Max marks	Conversion
1	CIE Assessment 1 (Written Test -1) At the end of 3 rd week	80 minutes	30	Average of three written tests 30
2	CIE Assessment 2 (Written Test -2) At the end of 7 th week	80 minutes	30	
3	CIE Assessment 3 (Written Test -3) At the end of 13 th week	80 minutes	30	
4	CIE Assessment 4 (MCQ/Quiz) At the end of 5 th week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Open book Test) At the end of 9 th week	60 minutes	20	
6	CIE Assessment 6 (Student activity/Assignment) At the end of 11 th week	60 minutes	20	
Total Continuous Internal Evaluation (CIE) Assessment				50
8	Semester End Examination (SEE) Assessment (Written Test)	3 Hours	100	50
Total Marks				100

Note:

- SEE (Semester End Examination) is conducted for 100 Marks theory courses for a time duration of 3 Hours.
- Three CIE (written test), each of 30 marks for a time duration of 80 minutes shall be conducted. Also, three CIE (MCQ or Quiz/Open book test/student activity or assignment) each of 20 marks for the time duration of 60 minutes shall be conducted. Any fraction at any stage during evaluation will be rounded off to the next higher digit
- Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10 DETAILED COURSE CONTENT

UNIT NO AND NAME	DETAILED COURSE CONTENT	CO	PO	CONTACT HRS	TOTAL
1 MATRICES AND DETERMINANTS	Definition and types of matrices	1	1,7	1	10
	Algebra of Matrices (addition, subtraction and scalar multiplication) problems	1	1,7	1	
	Multiplication of Matrices(problems)	1	1,7	1	
	Evaluation of 2x2 ,3x3 determinants and Singular matrices and problems in finding unknown variable	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables.problems	1	1,7	1	
	Minors, Cofactors of elements of square matrices of order 2 and 3	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix and problems	1	1,7	1	
	Characteristic equation and eigen values of a 2x2 matrix and problems	1	1,7	1	
2 STRAIGHT LINES	Slope of the straight line(provided with inclination and two points on the line as well) and problems	2	1,7	1	10
	Intercepts of a straight line and problems	2	1,7	1	
	Intercept form of a straight line and problems	2	1,7	1	
	Slope-intercept form of a straight line and problems	2	1,7	1	
	Slope-point form of the straight line and problems	2	1,7	1	
	Two-point form of a straight line and problems	2	1,7	1	
	General form of a straight line.problems on finding slope and intercepts.	2	1,7	1	
	Angle between two straight lines and conditions for the lines to be parallel and perpendicular and problems	2	1,7	1	
	Equation of a line parallel to the given line and problems	2	1,7	1	
	Equation of a line perpendicular to the given line.problems	2	1,7	1	

3	TRIGONOMETRY	Concept of angles and their measurement. Radian measures and related conversions (degree to radian and vice-versa) and problems	3	1,7	1	10
		Signs of trigonometric ratios in different quadrants (ASTC rule)	3	1,7	1	
		Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^\circ \pm \theta$, $180^\circ \pm \theta$, $270^\circ \pm \theta$ and $360^\circ \pm \theta$)	3	1,7	1	
		Problems on allied angles. (proving identities)	3	1,7	1	
		Problems on allied angles. (Finding values of x in an identity)	3	1,7	1	
		Trigonometric ratios of compound angles (without proof)	3	1,7	1	
		Trigonometric ratios of multiple angles ($\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$, $\cos 3A$ and $\tan 3A$)	3	1,7	1	
		Problems on multiple angles $\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$, $\cos 3A$ and $\tan 3A$	3	1,7	1	
		Transformation formulae (without proof) as sum to product. (Simple problems)	3	1,7	1	
		Transformation formulae (without proof) as product to sum. (Simple problems)	3	1,7	1	
4	DIFFERENTIAL CALCULUS AND APPLICATIONS	Definition of a derivative of a function. Listing the derivatives of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	4	1,3,7	1	11
		Addition and subtraction rule of differentiation and problems	4	1,3,7	1	
		Product rule and quotient rule of differentiation and problems	4	1,3,7	1	
		Product rule and quotient rule of differentiation and problems	4	1,3,7	1	
		Composite functions and their derivatives. (CHAIN RULE)	4	1,3,7	1	
		Composite functions and their derivatives. (CHAIN RULE). Problems	4	1,3,7	1	
		Successive differentiation up to second order	4	1,3,7	1	
		Slope of the tangent and normal to the given curve and their equations and problems	4	1,3,7	1	

	Rate measure: velocity and acceleration at a point of time and problems	4	1,3,7	1	
	Local Maxima and Minima of a function	4	1,3,7	1	
	Local Maxima and Minima of a function. Problems	4	1,3,7	1	
5 INTEGRAL CALCULUS AND APPLICATIONS	Definition of an indefinite integral. Listing the Integrals of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	5	1,3,7	1	11
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations	5	1,3,7	1	
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations. Problems	5	1,3,7	1	
	Evaluation of integrals with simple integrands and their combinations. Problems	5	1,3,7	1	
	Evaluation of integrals by Substitution method	5	1,3,7	1	
	Evaluation of integrals by Integration by parts	5	1,3,7	1	
	Evaluation of integrals by Integration by parts. Problems	5	1,3,7	1	
	Definition of definite integrals and their evaluation	5	1,3,7	1	
	Evaluation of Definite integrals. Problems	5	1,3,7	1	
	Area enclosed by the curves by integral method	5	1,3,7	1	
	Volume generated by the curve rotated about an axis by integral method	5	1,3,7	1	

First Semester Examination, Model Question Paper – 2020

Engineering Mathematics

Duration: 3Hours]

Subject Code: 20SC01T

[Max. Marks:100

Instruction: Answer one full question from each section. One full question carries 20 marks.

SECTION – 1

- 1**
- a** If the matrix $\begin{bmatrix} 2 & 4 & 6 \\ 2 & x & 2 \\ 6 & 8 & 14 \end{bmatrix}$ is singular then find x . **4**
- b** Find the A^2 for the matrix $\begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**
- c** Solve $2x - y = 3$ and $x + 2y = 4$ by using determinant method. **5**
- d** Find the inverse of the matrix $\begin{bmatrix} 2 & 3 & 1 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$. **6**
- 2**
- a** If $A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -3 & 4 \\ -1 & -1 & 1 \\ 0 & 4 & 2 \end{bmatrix}$ then find $(AB)^T$. **4**
- b** Verify whether $AB=BA$ for the matrices $A = \begin{bmatrix} 1 & 0 & 5 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 4 \\ 0 & -1 & 1 \\ 2 & 4 & -2 \end{bmatrix}$. **5**
- c** Find the Adjoint of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**
- d** Find the characteristic equation and eigen values for the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$. **6**

SECTION – 2

- 3**
- a** If the straight line is passing through the points (1, 2) and (3, 5) then find the slope of the line. **4**
- b** Write the standard intercept form of the straight line and hence find the equation of the straight line whose x and y intercepts are 2 and 3 respectively. **5**
- c** Write the standard slope-intercept form of a straight line. Find the equation of the straight line passing through the point (3, 5) and slope 4 units. **5**
- d** Find the equation of the straight line parallel to the line passing through the points (1, 3) and (4, 6). **6**
- 4**
- a** i) If a line inclined at 45° with x-axis find its slope. ii) Write the x and y intercept of the line $2x+3y=10$. **2+2**
- b** Find the equation of the straight line whose angle of inclination is 45° and passing through the origin. **5**
- c** Find the equation of the straight line perpendicular to the line $2x+6y=3$ and with the y intercept 2 units. **5**
- d** Find the acute angle between the lines $7x-4y=0$ and $3x-11y+5=0$. **6**

SECTION – 3

- 5**
- a** Express 75° in radian measure and $3\pi/2$ in degree. **4**
- b** Prove that $\cos(A+B)\cos(A-B) = \cos^2 A - \sin^2 B$. **5**
- c** Show that $\cos 2\theta = 2\cos^2 \theta - 1$. **5**

- d** Find the value of $\sin 120^\circ \cdot \cos 330^\circ - \sin 240^\circ \cdot \cos 390^\circ$ without using calculator. **6**
- 6 a** Find the value of $\sin 15^\circ$. **4**
- b** Simplify $\frac{\cos(360^\circ - A) \tan(360^\circ + A)}{\cot(270^\circ - A) \sin(90^\circ + A)}$. **5**
- c** Prove that $\sin 3\theta = 3\sin \theta - 4\sin^3 \theta$. **5**
- d** Prove that $\sin 20^\circ \cdot \sin 40^\circ \cdot \sin 80^\circ = \frac{\sqrt{3}}{8}$. **6**

SECTION – 4

- 7 a** Find the derivative of $y = x^2 + e^{2x} + \cos 2x - 2 \log x$ with respect to x . **4**
- b** Find dy/dx of $y = \frac{\sec x + \tan x}{\sec x - \tan x}$. **5**
- c** Find dy/dx of $y = \tan^{-1} \left(\frac{1+x}{1-x} \right)$. **5**
- d** If the $s = 2x^3 + 3x + 4$ represents the displacement of the particle in motion at time x , then find the velocity of the particle at $x = 2$ secs and acceleration at $x = 3$ secs. **6**
- 8 a** Find $\frac{dy}{dx}$ of $y = 3x^4 + 4 \log x + 2e^{3x} + \tan^{-1} x$. **4**
- b** If $y = e^{2x} \sin 3x$ then find $\frac{dy}{dx}$. **5**
- c** Find $\frac{d^2y}{dx^2}$ if $y = 3 \sin x + 4 \cos x$ at $x = 1$. **5**
- d** Find the equation of tangent and normal to the curve $y = x^2$ at the point $(1, 1)$. **6**

SECTION – 5

- 9 a** Evaluate $\int (x-1)(x+1)dx$. **4**
- b** Evaluate $\int_0^{p/2} \sin^2 x \, dx$ **5**
- c** Evaluate $\int x \sin x dx$. **5**
- d** Find the area bounded by the curve $y = 4x - x^2 - 3$, x-axis and ordinates $x = 1$ and $x = 3$. **6**
- 10 a** Evaluate $\int_0^2 e^x dx$. **4**
- b** Evaluate $\int \frac{4 \cos(\log x)}{x} dx$. **5**
- c** Evaluate $\int x e^x dx$. **5**
- d** Find the volume of the solid generated by revolving the curve $y = \sqrt{x^2 + 5x}$ between $x = 1$ and $x = 2$. **6**

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20ME11T	Semester	I
Course Title	MATERIALS FOR ENGINEERING	Course Group	Core
No. of Credits	4	Type of Course	Lecturing & Practice
Course Category	PC	Total Contact Hours	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	Basic sciences at matriculation level	Teaching Scheme	(L: T:P) = 4:0:0
CIE Marks	50	SEE Marks	50

1. COURSE RATIONALE

Materials for engineering play an important role as the vital tool for solving the problems of material selection and application in the production and manufacturing of equipment/machines, devices, tools, etc. Therefore, an engineering diploma student must be conversant with the properties, composition and behavior of materials from ***the point of view of reliability, sustainability and performance of the product***. The study of basic concepts of materials will help the students understanding engineering subjects where the emphasis is laid on the application of these materials.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences

1. Select Engineering materials based on properties, behavior and environmental effect for given engineering application.
2. Identify microstructure and alloying elements of given alternative materials for suitable application

3. COURSE OUT COMES

CO1	Able to understand the various properties of materials u in engineering
CO2	Able to Select relevant ferrous materials and cast iron, non-ferrous metals and advanced materials for Engineering applications
CO3	Adopt International practice of material designation and coding system
CO4	Able to find relevant heat treatment process for altering the properties of metals
CO5	Able to Suggest relevant Surface treatment process for protecting the surface of materials

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours
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No.		
I.	Basic of Engineering Materials.	06
II.	Steel and alloys	10
III.	Nonferrous Metals and alloys	08
IV.	Nonmetallic and Advanced materials.	10
V.	Heat treatment process.	10
VI	Surface treatment for Materials	08
	Total	52

5. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Unit Learning outcomes (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 BASICS OF ENGINEERING MATERIALS	1. Identify the crystal structure of the given material 2. Explain specimen preparation procedure 3. Distinguish various engineering properties of materials	1.1 Classification of Engineering Material 1.2 Structure of metal-unit cell, BCC, FCC and HCP structures 1.3 Types of microscopes 1.4 Specimen preparation procedure 1.5 Properties of metals-Physical-mechanical-Thermal properties	06-0-0
UNIT-2 STEELS AND ALLOYS	1. Select relevant cast iron for the given job with justification 2. Select relevant steel for the given application 3. Able to designate different plain and alloy steel, cast iron as per BIS, ASME	2.1 Types of cast iron-White-grey-Nodular-malleable - Selection of appropriate cast iron for engineering application 2.2 Broad classification of steels I. Plain carbon steels-Definition-types-properties-composition and applications of low-medium-high carbon steels II. Alloy steels-definition-effect of alloying elements on properties of alloy steel III. Tool steel-cold worked-Hot work tool steel-High speed steel (HSS) IV. Stainless steel-Types and application V. Spring steel-composition and application 2.3 Steels for following-shaft -axles-bolts-nuts-Agriculture Equipment's-household utensils-Antifriction bearings. 2.4 Designation and coding (as per BIS, ASME) of plain & alloy steel and cast iron.	10-0-0

<p align="center">UNIT-3 NON FERROUS METALS AND ALLOYS</p>	<ol style="list-style-type: none"> Describe the properties and application of the given copper alloy Describe the properties and application of the given Aluminum alloy Describe the properties and application of the given Nickel alloy Describe the properties and application of the given Bearing material Select relevant non ferrous material for specified application with justification 	<ol style="list-style-type: none"> Copper and its alloys-Brasses-Bronzes-Chemical composition-Properties and applications Aluminum and its alloys-Y-Alloy-Hindalium-duralium with their -Chemical composition-Properties and applications. Nickel and its alloys with their -Chemical Composition-Properties and applications Bearing materials like White metal (Sn based), Aluminum Bronzes-Self-lubricating Bearings 	<p align="center">08-0-0</p>
<p align="center">UNIT-4 NON METALIC AND ADVANCED MATERIALS</p>	<ol style="list-style-type: none"> Distinguish between metallic and non metallic materials on the basis of given composition Select relevant non metallic material for the given job with justification Select relevant Composite material for the given job with justification Select relevant Alternative material for the given job with justification 	<ol style="list-style-type: none"> Polymeric materials-Polymer-types-characteristics Classification of Polymers on basis of Thermal behavior -Thermo plastics and thermo setting plastics-Properties -uses Ceramics-types of ceramics-properties and applications Composite materials-properties and application of laminated and fiber reinforced materials Advanced engineering materials-properties and application of, Biomaterials, nano materials and smart materials Designation and coding of important non metallic materials as per BIS 	<p align="center">10-0-0</p>
<p align="center">UNIT-5 HEAT TREATMENT PROCESSES</p>	<ol style="list-style-type: none"> Interpret Iron-carbon equilibrium diagram of Mild steel Identify the given phase diagram and reactions with justification Conceptualize with sketches the specified heat treatment process Select relevant Heat treatment process for the given material with justification 	<ol style="list-style-type: none"> Concept of phase-pure metal-alloy -Solid solution Iron-carbon equilibrium diagram indicating various phases-Critical temperature and its significance-Reactions on Iron carbon equilibrium diagram of Mild steel Heat treatment-Definition- purpose of heat treatment--Mechanism of heat treatment Types of heat treatment process Annealing-purposes of annealing-Annealing temperature range-applications. Normalizing- purposes of Normalizing-temperature range-Broad applications Tempering-Purposes of tempering-Types of tempering-Applications Hardening -purposes of hardening -temperature range- Broad applications of hardening Case hardening- Carburizing-Nitriding-Cyaniding 	<p align="center">10-0-0</p>

UNIT-6 SURFACE TREATMENT FOR MATERIALS	1. Describe corrosion and its prevention 2. Select proper electrolysis process for surface coating	6.1 Corrosion-types and reasons for corrosion, protection from corrosion 6.2 Surface protection treatments-Methods of Surface treatments. 6.3 Electrolytes and Non-electrolytes – definition-Types of electrolytes 6.4 Construction and working of electro chemical cell 6.5 Electro-chemical series, galvanic series. 6.6 Surface coating through electrolysis-setup and working.	08-0-0
	TOTAL		52-0-0

6. SUGGESTED PRACTICAL SKILL EXERCISES (DEMONSTRATIVE)

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks.

Sl.No	Practical Outcomes/Practical exercises	Unit No.	PO	CO
1	Prepare specimen of a given material for Microscopic examination (This may be covered during industrial visit).	1	1,4	1
2	Use Metallurgical microscope to interpret Microstructure of steels and alloy steels on standard specimen (This may be covered during industrial visit).	1,2	1,4	1,2
3	Analyze content of ferrous/nonferrous material using photo Spectrometer. (This may be covered during industrial visit).	1,2,3	1,4	1,2
4	Use Brinell hardness tester to determine the hardness of a given sample (This may be covered in Mechanical testing lab of institute).	1,2,3,4	1,4	1,2
5	Use Rockwell hardness tester to determine the hardness of a given sample (This may be covered in Mechanical testing lab of institute).	1,2,3,4	1,4	1,2
6	Use relevant hardness tester to determine hardness of Mild steel specimen before heat treatment and compare the same with another specimen of same grade after heat treatment (This may be covered in Mechanical testing lab of institute).	1,2,5	1,4	1,2,4
7	Use relevant hardness tester to determine hardness of pure Copper Specimen (This may be covered in Mechanical testing lab of institute).	1,3	1,4	1,2
8	Use relevant hardness tester to determine hardness of any one copper alloy (This may be covered in Mechanical testing lab of institute).	1,3	1,4	1,2
9	Study corrosive materials to identify different types of corrosion of Metals.	6	1,4	5
10	PROBLEM BASED LEARNING: Group of 4-5 students will identify and collect five machine / product components which are made from different engineering materials and which are also failed in their applications. Students will measure and sketch the components (freehand-orthographic (Views) with dimensions. Students in group will also discuss the reasons of failure and will note down the discussion and outcome.	ALL		

NOTES:

1. It is compulsory to prepare logbook of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by the teacher
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Term work report includes term work, objects taken for identification for laboratory work, student activity; parts experimented as student activity and logbook along with student activities.
4. Term work report is compulsory part to be submitted at the time of practical end semester examination.
5. Term work report must not include any photocopy/ printed manual/pages, lithos, etc. It must be handwritten / hand drawn by student only.
6. For CIE, students are to be assessed for Skills/competencies achieved. Students are to be asked to identify materials, select proper materials, etc.

7. MAPPING OF CO WITH PO (Suggestive only)

CO No	Course Outcome	PO's Mapped	Units Linked	Cognitive Level			Teaching Hours	Marks			
				R	U	A		R	U	A	Total
CO 1	Able to understand the various properties of materials used in engineering	1,4	1,2,3,4	R	U	—	10	10	28	—	38
CO 2	Able to Select relevant ferrous materials and cast iron, non-ferrous metals and advanced materials for Engineering applications	1,2,3,4	2,3,4		U	A	18	—	40	30	70
CO 3	Adopt International practice of material designation and coding system	1	2,4		U	A	06	—	12	08	20
CO 4	Able to find relevant heat treatment process for altering the properties of metals	1,2,3	5		U	A	10	—	15	25	40
CO 5	Able to Suggest relevant Surface treatment process for protecting the surface of materials	1,2	6		U	A	08	—	12	20	32

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
MATERIAL FOR ENGINEERING	CO1	3	1	1	2	0	0	0
	CO2	3	1	1	2	0	0	0
	CO3	3	0	0	0	0	0	0
	CO4	3	1	1	0	0	0	0
	CO5	3	1	0	0	0	0	0
Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

8. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Massive Open online courses (MOOCS) may be used to teach various topics/subtopics.
2. Lecturer method(L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes

- About 15 to 20% of the topics/subtopics which is relative simpler or descriptive in nature is to be given to the students for self-directed learning
- Arrange visits to nearby Metallurgical labs/Industries/ Academic institution having research centre facility /Research labs for various understanding of metallurgical microscopic examination of materials and various heat treatment process
- Show Video/animation films to explain functioning of various application of materials in Engineering domain
- Use different instructional strategies in classroom teaching.

9. SUGGESTED LEARNING RESOURCES:

Sl.No.	Author	Title of Books	Publication/Year
1	J. W. Martin	Materials for engineering	WOODHEAD PUBLISHING LIMITED Cambridge England
2	GBS Narang	Materials science	Khanna Publishers, New Delhi.
3	R.K.Rajput	Materials science	Laxmi Publication, Dariyaganj, New Delhi.
4	R.S.Khurmi &R.S.Sedha	Materials science	S.Chand
5	D.S.Nutt	Materials science and metallurgy	S.K.Katariya and sons, Delhi.
6	V.Raghavan	Materials science and Engineering	EEE Edition, Prentice Hill, New Delhi.
7	Sidney Avner	Physical Metallurgy	Tata McGraw-Hill Education (2011).

List of Major Equipment/Instrument

- Metallurgical Microscope.
- Standard specimens.
- Furnaces to perform heat treatment process.
- Sorted/required quenching mediums.
- Hardness tester-to check Rockwell hardness-scales A,B and C.
- Other hardness testers like scleroscope, etc.
- Polishing machine to prepare specimens with necessary consumables.
- Hand grinder – specifically to prepare specimens and for spark testing.
- Other consumables.

C. List of Software/Learning Websites

1. <http://vimeo.com/32224002>
2. http://www.substech.com/dokuwiki/doku.php?id=iron-carbon_phase_diagram
3. <http://www-g.eng.cam.ac.uk/mmg/teaching/typd/>
4. <http://www.ironcarbondiagram.com/>
5. <http://www.youtube.com/watch?v=fHt0bOfj3T0&feature=related>
6. <http://www.youtube.com/watch?v=cN5YH0iEvTo>
7. <http://www.youtube.com/watch?v=m9l1tVXyFp8>
8. <http://www.youtube.com/watch?v=98lh5Q0M0cg>
9. <http://www.youtube.com/watch?v=KlyGr-1snMY>
10. http://en.wikipedia.org/wiki/Materials_science
11. <http://www.studyvilla.com/electrochem.aspx>

10. SUGGESTED LIST OF PROPOSED STUDENTS ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA)

1. Select any five objects (3 metallic and 2 nonmetallic) which will be used in laboratory and list the material of selected objects.
2. Prepare the material list of given tools and commonly used items such as razor blade, knife, scissor, hacksaw blade, carpentry chisel, fix spanner, etc. Also give reason(s) for using such material and discuss your answers with the teacher.
3. Take dilute acid which is commonly used at our home for cleaning purpose and put one scrap iron piece and one nonferrous metal piece in it for minimum 12 hours. Take out these two pieces by following all safety norms/steps (without touching acid) and observe the changes. Discuss with your teacher.
4. Group of 3-5 students will visit LOCAL AUTOMOBILE REPAIR SHOP and will identify at least 5 nonmetallic components for a given AUTOMOBILE / assembly. Also list the material of identified machine / assembly components.
5. List at least three questions individually which you would like to ask for followings:
 - i. Comparison of iron and fiber reinforced plastic.
 - ii. Comparison for strength of wood and cast-iron.
 - iii. Annealing-heat treatment process.
 - iv. Materials used for construction of any bike.
 - v. Materials used for construction of any home appliance, like mixer, washing machine, iron, etc.
 - vi. Any other relevant activity added by teacher including preparing industrial visit report.

11. COURSE ASSESSMENTS AND EVALUATION CHART

Sl.No	Assessment	Type	Time frame in semester	Duration	Max marks	Conversion
1.	CIE Assessment 1	Written test-1	- At the end of 3 ^d week	80 minutes	30	Average of three written tests-1,2,3 for 30
2	CIE Assessment 2	Written test-2	- At the end of 7 th week	80 minutes	30	
3	CIE Assessment 3	Written test-3	- At the end of 13 th week	80 minutes	30	
4	CIE Assessment 4	MCQ/Quiz	- At the end of 5 th week	60 minutes	20	Average of three Assessment 4,5,6 For 20
5	CIE Assessment 5	Open book test	- At the end of 9 th week	60 minutes	20	
6	CIE Assessment 6	Student activity&presentation	- At the end of 11 th week	60 minutes	20	
Total Continuous Internal Evaluation (CIE) Assessment						50
Semester End Examination (SEE) Assessment (Written Test-Pen-paper Mode), conduction for 100 marks and converted for 50				3 Hours	100	50
Total Marks						100

Note:

- SEE is conducted for 100 Marks.
- I.A. test shall be conducted as shown in the above table.
- Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator.

RUBRICS FOR ACTIVITY						
Appropriate rubrics to be developed by the faculty as per the activity						
Dimension	Beginning 2	Developing 4	Satisfactory 6	Good 8	Exemplary 10	Student Score
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8 marks

Model Question Paper

I A Test (CIE)

Programme:		Semester: I			
Course:		Max Marks: 30			
Course Code:		Duration: 1 Hr 20 minutes			
Name of the course coordinator:		Test: I/II/III			
Note: Answer one full question from each section. One full question carries 10 marks.					
Qn.No	Question	CL	CO	PO	Marks
Section-1					
1.a)					
b)					
c)					
2.a)					
b)					
c)					
Section-2					
3.a)					
b)					
c)					
4.a)					
b)					
c)					
Section-3					
5.a)					
b)					
c)					
6.a)					
b)					
c)					

Model Question Paper Semester End Examination

Programme:	Semester: I
Course:	Max Marks: 100
Course Code:	Duration: 3 Hrs

Instruction to the Candidate: Answer one full question from each section. One full question carries 20 marks.				
Qn.No	Question	CL	CO	Marks
Section-1				
1.a)				
b)				
2.a)				
b)				
Section-2				
3.a)				
b)				
4.a)				
b)				
Section-3				
5.a)				
b)				
6.a)				
b)				
Section-4				
7.a)				
b)				
8.a)				
b)				
Section-5				
9.a)				
b)				
10.a)				
b)				

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20EG01P	Semester	I/II
Course Title	COMMUNICATION SKILLS	Course Group	Core
No. of Credits	4	Type of Course	Tutorial + Practice
Course Category	Workplace Skills / Humanities & Social Sciences	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Nil	Teaching Scheme	(L:T:P)= 0:1:2
CIE Marks	60	SEE Marks	40

Preamble

Today, Communication is a very important skill for the success of every millennial student. Millennials affinity to use digital media for communication, changing career and working landscapes, and greater competition in colleges and workplaces makes enhancing student communication skills beyond language a must. Rote learning a few tips or tricks the night before an interview or performance review won't do the job if students are trying to make an impression in highly collaborative workplaces of the future. Expectations from students aspiring to be part of such future workplaces are that they have not just good verbal and non-verbal communication skills but also a good understanding of how to use modern tools for effective communication.

Scope

To enable students to communicate clearly and effectively, by improving their verbal and non-verbal communication skills, as well as enhancing interpersonal skills and knowledge of appropriate tools for specific communication strategies.

Course Objectives

The objectives of communication skills course are:

- Build better communication skills: oral and written expressions and body language
- Enable critical thinking
- Empower with active listening skills
- Enable team work/collaboration

Instructional Strategy

To achieve course objectives, it is important to provide the blended mode of instruction for each of the concepts. This blended mode of instruction enables and empowers students with:

- **Understanding of Concept (Theory):**
 - Through definitions, discussions, explanation, conclusions.

- Through demonstrations: Show films or other workplace clips that model various conversation skills. This provides greater clarity of the concept by
 - Enabling observation skills
 - Helping in expression of gesture
 - building confidence
- **Application of Concept (Learning by doing):** It is imperative that to become a good communicator, the skills have to be built by applying the concept in the hypothetically created real life situations. Students are encouraged to participate in each of these activities during lab session to help build the effective communication skills.
 - Use of technology tools like audio books, apps like voice thread or paper telephone, etc.
 - To help in workplace conversions.
 - To increase active listening, pronunciation
 - To help in voice modulation
 - Group discussion
 - Reinforce active listening
 - Enable group debate to imbibe healthy communication strategies
 - Sharpen the skills of “Asking clarifying questions”
 - Sharpen Feedback / Response skills
 - Time management skills
 - Group presentations/peer reviews
 - Enable team work
 - Assess concept understanding
 - Sharpen both oral and written communication skills
 - Group activities:
 - foster critical thinking
 - enable reflective learning
 - Tools usage:
 - Understand the difference between a Dictionary and a Thesaurus
 - Understand “When” and “How” to use these tools for communication

Course Outcomes

After completion of this course, the student shall be able to;

- Communicate
 - Identify audience (colleagues, management, customers/vendors) and use the right methodologies for communication using the right terminology, names, grades and other nomenclature pertaining to the trade, tools and specific equipment.
- Write
 - in at least one language correctly
 - basic level notes and observations
 - job cards, work sheets, basic report writing and responding to emails, simple presentations, job applications, resume
- Read
 - Technical manuals, task sheets/job orders, policies and regulations pertinent to the job, including OEM guidelines.
 - all instructions given in memos, manuals, documents or those put up as posters across the premises
 - safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- Question
 - Ask right questions

- Use different ways of asking questions
 - Clarifying/Open ended (What, Why, When, Who, Where, How)
 - Close ended
- Present
 - With right Posture & Gesture
 - With greater concept/content clarity
 - With high confidence
 - With voice modulation to capture the attention of audience
- Use technology tools
 - Office productivity
 - Word : Report writing
 - PowerPoint : Creating effective presentations
 - Excel : Data handling/Charts

Course Content

The following are the various units to be taught and assessed in order to ensure the student is able to demonstrate the Course Outcomes mentioned in the **Course Outcome** section.

Pre-assessment:

Teachers are required to administer pre-assessment before starting the actual instruction. This helps in gathering information about students' like their attitude, beliefs, interests, and learning abilities.

Pre assessment expectations:

- To assess current language skill (Pronunciation, usage, sentence formation)
- To assess their ability to comprehend and respond to the instruction
- To assess their interest towards accepting ideas and learning
- To assess their current communication skills: asking questions, listening, communicating with confidence

UNIT 1: English – Introduction Learning outcome: Learn English pronunciation, functional grammar concepts & Reading. To gain confidence in spoken English. This section also covers phonemic awareness, grammar rules to set a strong base for application mode of communication.			
Phonemic awareness	Going over 42 sounds	<i>Examining the understanding of sounds</i> <i>Spelling patterns (Consonant and Vowel blending: CVC words)</i> Pronunciation <ul style="list-style-type: none"> ○ List of words given above (Commonly used words) ○ Diction (speech) 	0:2:2
Functional Grammar Concepts	Revision of Grammar concepts	<i>Parts of speech</i> <i>Sentence structure</i> <i>Examples of right sentences</i> <i>Gender, Singular, Plural</i>	2:0:0 0:1:0 0:1:0

		<i>Usage of voice (active and passive) and tenses</i>	0:2:0
Comprehension activities	Reading conversations (check the unit wise activity table)	<i>Written test for each comprehension</i>	0:0:2
UNIT 2: Communication Lesson outcome: At the end of the session: <ul style="list-style-type: none"> • Students should be able to <ul style="list-style-type: none"> ○ Understand the communication process, influence of voice/tone, logical organization of thought, comprehension, listening skills. ○ Understand the basic building blocks of communication and strategies for working with each of these blocks. ○ Learn about carrying self, etiquettes of communication. ○ Build positive attitude about self and towards handling communication. ○ Learn the process for effective communication, problem solving techniques, to be confident communicator. 			
INTRODUCTION:	What is communication? Why communication? How do we communicate? Communication Theory and Process	<i>How communication happens?</i> <ul style="list-style-type: none"> • Pictorial representation of communication framework • Elements of communication: sender, receiver, message • Refer to activity in Unit activity section. 	1: 2:0
	Barriers to communication	<i>Language</i> <ul style="list-style-type: none"> • Lack of linguistic ability • Grammar <i>Context</i> <ul style="list-style-type: none"> • Psychology • Physiology <i>Systematic</i> <ul style="list-style-type: none"> • inefficient or inappropriate information systems 	0:2:2 (video clip play, content tutorial, role play)

		<ul style="list-style-type: none"> • Lack of communication channel • lack of understanding of the roles and responsibilities <p>Attitude</p> <ul style="list-style-type: none"> • Perceptions • Preconceived notions 	
Building blocks of communication	People Message Context Listening	<p>People:</p> <ul style="list-style-type: none"> • Empathising with sender's or receiver's perception • Intent & Impact on the sender/receiver • Think – Feel – Do model <p>Message:</p> <p>Message channels:</p> <ul style="list-style-type: none"> ○ Inperson, email, memo, report <p>Be aware of Mental Filters</p> <ul style="list-style-type: none"> ○ Level of understanding/knowledge ○ Personal concerns ○ Pre conceived notions <p>Organize message:</p> <ul style="list-style-type: none"> ○ Critical thinking: organize your thoughts? <p>Use following strategy:</p> <ul style="list-style-type: none"> ▪ Who ▪ What ▪ When ▪ Why ▪ How <ul style="list-style-type: none"> ○ Bundle Primary and Secondary information ○ Mindful about non-verbal message ○ Tone of voice <p>Examples of Types of messages:</p> <ul style="list-style-type: none"> ○ Inform ○ Persuade ○ Cyclical <p>Avoiding Miscommunication:</p> <ul style="list-style-type: none"> • Evaluate (Checking for) understanding of the intent of the message with the receiver – by asking clarifying questions? 	0:4:4

		<p>Context: Define context Importance of context Tune into context</p> <ul style="list-style-type: none"> • Timing • Location • Relationship <p>Listening: Importance of listening Barrier to listening:</p> <ul style="list-style-type: none"> • Mental filters • Multitasking • Information overload <p>Strategies for listening:</p> <ul style="list-style-type: none"> • Recall • Acknowledge • Summarize • Listen with eyes for connecting to non-verbal connection • Empathize • Pay attention • Ask clarifying questions <p>Effective Listening Behaviors:</p> <ul style="list-style-type: none"> • Maintaining relaxed body posture • Leaning slightly forward if sitting • Facing person squarely at eye level • Maintaining an open posture • Maintaining appropriate distance • Offering simple acknowledgements • Reflecting meaning (paraphrase) • Reflecting emotions • Using eye contact • Providing non-distracting environment <p>Behaviors that hinder effective listening</p> <ul style="list-style-type: none"> • Acting distracted • Autobiographical (Telling your own story without acknowledging theirs first) • No response • Invalidating response, put downs • Interrupting • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment 	
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[illegible]

Using technical Jargons:	<i>Assignment based project encouraging pupil to use the technical terms in the written and verbal communication.</i> This requires understanding of the core concepts (from subject teacher) and integrating the concept with communication concepts to gain the real time application knowledge.	<ul style="list-style-type: none"> • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment 	
UNIT4: Non-Verbal Communication: Lesson outcome: At the end of this unit, students should be able to: <ul style="list-style-type: none"> • Understand the importance of Body language and its impact. • Use the strategies for effective body language. • Understand the relevance of different elements of emails and how to use them. • Develop the confidence in presenting written content in logical and organized manner with a definitive email framework. • Write different email formats confidently: Job application, Request email, apology email, email responses/feedback. • Confidently write Resume/Curriculum-vitae, Reports, Formal letters and portfolio. • Confidently communicate using technical jargons and with increased vocabulary. 			
Body Language	Strategies	Body language tips: <ul style="list-style-type: none"> • Keep appropriate distance • Take care of your appearance • Maintain eye contact • Smile genuinely 	0:3:4

<p>Art of Professional writing:</p>	<p>Written communication</p> <p>Emails:</p> <ul style="list-style-type: none"> Structured framework for writing formal emails to emphasize on professional communication in English 	<p>Do's and Don'ts:</p> <p>dos:</p> <ul style="list-style-type: none"> smile stand up confident and straight use appropriate hand gestures Make eye contact with audience Hold neat note cards while presenting content <p>Don'ts</p> <ul style="list-style-type: none"> point at anyone rock backwards and forwards pace across front of room read off slides <p>read off notes</p> <p>Different types of emails: Job application, request letter, letter writing and quick notes</p> <p>Structure of email text:</p> <ul style="list-style-type: none"> Introduction – Beginning of the letter and this plays crucial role as it provides first impression to the reader. <ul style="list-style-type: none"> Who: author (name + position and organisation) what: purpose - controlling idea (what author does or feels) Development: Expand on the Controlling Idea/purpose of the email by answering relevant WH questions <ul style="list-style-type: none"> what, when, where, who, whom, which, whose, why, and how Conclusion: Positive words <ul style="list-style-type: none"> Verb: thank, appreciate, hope, wish Phrases: be glad about, look forward to <p>Email writing samples and practice content in the activity section.</p>	<p>0:2:4</p>
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		<p>Additional essential writing skills – Framework will be provided and assignments will be advised:</p> <ul style="list-style-type: none"> • Resume writing /CurriculumVitae • Report Writing • Portfolio writing • Formal letters 	
UNIT5: English - Reading Skills, Grammar & Vocabulary Lesson Outcome: At the end of the session, student should be able to: <ul style="list-style-type: none"> • Read sentences with punctuation. • Understand the techniques of reading complex words. • Understand and apply the reading techniques for efficient reading. • Understand the usage of communication tools like Thesaurus and Dictionary that aids in improving vocabulary and reading. • Understand and apply the functional grammar aspects in day today communication. 			
Reading skills	<i>Comprehension activities</i> <i>Techniques for smart reading</i>	Passage comprehension Conversation comprehension Strategies for smart reading: <ul style="list-style-type: none"> • Skimming and scanning through the text, inferring the meaning • Questioning, summarizing 	0:2: 2
Functional Grammar	<i>List of Commonly confused words and how to use/avoid them</i>	Set of words to accelerate the English language learning and usage. Strategies to use these words effectively	0:1: 2
Vocabulary	<i>Sentences:</i> <ul style="list-style-type: none"> ○ Declarative sentence ○ Imperative sentence ○ Interrogative sentence ○ Exclamatory sentence 	Techniques of categorizing sentences, understanding how to build with punctuation and effectively use in the verbal and non-verbal communication. This involves more of hands on activities.	0:1: 2

	<p>Punctuation, Content organization and Comprehension</p> <p>Techniques:</p> <ul style="list-style-type: none"> Learning new words from comprehension by way of repetition and usage of these words in communication Listing technical jargons and repeatedly using in the communication with peers and teachers Chunking and reading words <p>Tools</p> <ul style="list-style-type: none"> Understand the difference between a Dictionary and a Thesaurus Understand “When” and “How” to use these tools for communication 	<p>Comprehension remains as a main activity to accelerate the learning of spoken and written English language</p> <p>Increases vocabulary, builds confidence and helps in becoming a good communicator.</p> <p>Activities are done, tips are provided to efficiently implement these strategies.</p>	<p>0:1:2</p> <p>0:1:0</p>
<p>Unit 6 - Communication Tools</p> <p>Lesson Outcome:</p> <p>At the end of the session, student should be able to:</p> <ul style="list-style-type: none"> Use Email technology efficiently for communication Present content in the PPT format efficiently Understand different platforms available for web conferencing and efficiently work with them. Create reports and data management. 			
Introduction	Evolution of communication tools	Traditional vs. modern communication tools Advantages and Disadvantages	1:0:0
	Email using Gmail	How to use the tools effectively? Formatting, layout	0:1:1

One-to-One		Including attachment Working with "To, CC, BCC" and Subject fields effectively Using signature	
One-to-Many	Presentation using PowerPoint	Creating, Editing, Saving slides Using Animation Formatting options	0:1:2
	Webinar / Web Presentation (zoom, Google meet, Skype)	Hosting online meeting using online meeting tools Inviting people Sharing screen	0:1:1
Other	Reports using MS Word	Open, close, Edit and Save usage with documents Layout and strategies for creating report Sample report creation demo with follow on assignment Core subject project report submission assignment	0:1: 2
	Data & Graphs using MS Excel	Open, close, save and edit the excel document Creating data Using basic maths operation in Excel for working with data Creating simple graphs Assignment: For example, creating statistics of subject wise activities completed for 6 months in the credit course	0:1: 2
			4:34:40

Course Class Activity List (Unit-wise)

The following are the various activities that faculty could conduct for each unit are presented below;

Unit No.	Unit Title	Unit Activities
UNIT 1: Activities:	English – Introduction	1. 42 sounds revision:

		<p>1. s, a, t, i, p, n</p> <p>2. c k, e, h, r, m, d</p> <p>3. g, o, u, l, f, b</p> <p>4. ai, j, oa, ie, ee, or</p> <p>5. z, w, ng, v, oo, oo</p> <p>6. y, x, ch, sh, th, th</p> <p>7. qu, ou, oi, ue, er, ar</p> <ul style="list-style-type: none"> • This helps in reducing the native language impact • Helps in understanding Short and Long vowel words • Helps in spelling • Helps in pronunciation <p>2. Reading commonly used words loud from the list (list will be provided in the workbook):</p> <ul style="list-style-type: none"> • This helps in getting familiarity with the word pronunciation and helps in reading. <p>3. Blending words activity:</p> <ul style="list-style-type: none"> • Write simple three letter words (CVC/CVCC/CVCV) pattern words: Can, Cap, Snap, cape (list will be provided in the workbook) • Show how to blend with the sound. • Starting with 3 letter words and continuing to 6 to 8 letter words. <i>Note: Remember before going through big words, it is always important to assess and ensure the student is aware of all the 42 sounds and are comfortable making small words.</i> <p>Parts of Speech:</p> <p>building sentence using parts of speech: Demonstration by teacher: (Will be explained in the book as an example)</p> <p>Jumbled parts of speech: Student should pick the right order to build meaningful sentence:</p> <p>(More samples will be provided in the workbook)</p> <ul style="list-style-type: none"> • College go to you everyday. • Makes spider web the a <p>Gender, Singular and Plurals:</p>
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		<ul style="list-style-type: none"> • Match the following activity for singular and plural • Fill in the blanks activity for genders <p>Reading & Comprehension: Conversation</p> <ul style="list-style-type: none"> • Conversation at the bank (provided in the workbook along with few more conversation samples) • Questions based on this conversation will be provided in the workbook
Unit 2	Communication	<p>Oral:</p> <ul style="list-style-type: none"> • Introduce yourself? <p>Visual:</p> <ul style="list-style-type: none"> • Video clip on communication etiquette • Pictures (in addendum section): do's and don'ts of communication <p>Group of students, one participant whispers in another participant's ear, and this message has to be passed on in a circle until it reaches back the sender. Making a note of process of message conveyed and how it was perceived.</p> <ul style="list-style-type: none"> ○ Identify the communication gap if any. ○ Discuss and conclude the communication framework importance ○ Discuss/reiterate how to make communication framework strong. <p>1. Role play to assess the understanding of building blocks of communication: (can be tapered to the core skills of diploma courses, following are just few of the examples)</p> <ol style="list-style-type: none"> a. Announcing the result of students in the class or b. Announcing the job placement of students (people, context, message, form of message) c. Discussing the guidelines of examination (listening skills)

		<p>d. Listening to the weather forecast without seeing and making note of the listening ability (play video of weather forecast) – Assess based on how much the student is able to recall.</p> <p>2. Run National geography/Discovery Video clip/subject related technical video clip on YouTube: Check:</p> <ul style="list-style-type: none"> ○ if the student has not understood what a speaker expressed ○ about work or safety related issues ○ seeking clarification or advice appropriately from colleague, customer, management or vendor
Unit 3	Verbal communication	<p>1. Voice/tone modulation: Showcase video Discussion: What was right? What was wrong? How it should have been better?</p> <p>2. Picture description activity (memory test): Class split into groups A, B C,D: (two or four groups of at least 5 people each): Teacher shows different picture to each group for three minutes. Now each group has to remember what was on the picture and discuss with each other, write down the elements on a piece of sheet and share it with the teacher. Group that remembers more will be the winner.</p> <p>Teacher to observe the body language of a student in the group, listening skills of a student, presentation skill, comprehension skill, content delivery skill, confidence level, team work. And reiterate the concepts, dos and don'ts, and discuss what could have been done better. (details of pictures will be given in the workbook)</p> <p>3. Telephonic conversation:</p>

		<p>Role play by a teacher: Call Airtel/Vodafone department and asking for the phone number portability process.</p> <p>After teacher demonstrates, teacher divides the class in to small groups of three people.</p> <ul style="list-style-type: none"> • Each group will be given a different telephone conversation assignment (samples will be provided in workbook). • Two people in the group pretend to converse over the phone, and the third person makes a note of right and wrong approaches during the communication.
Unit 4:	Non-verbal communication	<p>Body language</p> <p>Simon Says:</p> <p>Instructions and set up :</p> <ol style="list-style-type: none"> 1. Series of instructions to the group that are to be copied/reproduced. Start slowly and increase the pace 2. State the following actions as YOU do them: <ul style="list-style-type: none"> ○ Put your hand to your nose ○ Clap your hands ○ Stand up ○ Turn around ○ Touch your shoulder ○ Sit down ○ Stamp your foot ○ Cross your arms ○ Put your hand to your forehead – <u>BUT WHILE SAYING THIS PUT YOUR HAND TO YOUR NOSE</u> 3. Observe the number of group members who copy what you did rather than what you said. <p>Outcome of this activity:</p> <p>Discuss how body language can reinforce/influence verbal communication and drive the importance of body language and how to work on it</p>

		<ul style="list-style-type: none"> Email communication & Using technical jargons: <p>Sample letter writing as assignment to students. (list will be provided in the text book – Request, apology, job application and relevant email formats that are useful for students post diploma course)</p> <ul style="list-style-type: none"> There will be at least one assignment that utilizes technical jargons in email communication.
UNIT 5:	English - Reading Skills, Grammar & Vocabulary	<ul style="list-style-type: none"> Reading passage (Provided in workbook) Reading passage from the text book Comprehension: Passage & Conversation (will be provided in workbook) Chunking words and reading activities
Unit 6:	Communication tools	<ul style="list-style-type: none"> Email writing activities: Writing emails using email provider. Theme based email writing Report writing assignment <p>Writing about a machinery tool/interior designing plan? Related to the diploma stream.</p> <ul style="list-style-type: none"> Resume writing assignment Data handling: Collecting data about machines/number of students passed out of college for last three years and creating graph about it. Presentation: <ul style="list-style-type: none"> About learning in the communication class Concept presentation

Course Assessment Strategies

Assessment Methodology

- Observation (role play activities, team activities, demonstration)
- Questions & Answer – Periodic Assessment

Assessment Grading RUBRICS

Language Basics	
Beginner	Doesn't know / understand
Intermediate	can read and identify commonly used words
Good	Confident , able to communicate well with known people
Advanced	Confident , able to communicate well with anyone using a English

Expert	Can read, understand; Also comprehend & can train others
Reading	
Beginner	Beginning to read, has native language impact
Intermediate	can read, identify words, build simple 3/4/5 letter words easily
Good	Can read, understand, build words, read simple sentences ; Also comprehend
Advanced	Can read, understand, build words, read simple sentences ; Also comprehend
Expert	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words
Inter personal communication	
Beginner	is shy, doesn't talk/express
Intermediate	hesitates to communicate – due to lack of confidence / ability, can talk to known people
Good	can talk to unknown people, less confident, does not express, has hard time working as a team
Advanced	can talk to unknown people, confident, can't express, has hard time working as a team
Expert	confident, can talk to anyone, express well, works well in the team
Body language	
Beginner	Is shy, not open to communicate, has hard time making friends
Intermediate	Knows basics of Body language, practices sometimes
Good	Knows basics of Body language, practices most times, has less confidence in presenting content
Advanced	Knows and practices good body language all times, can present content
Expert	Knows and practices good body language all times, is an example, Leads the pack to get better
Listening Skills	
Beginner	Just hears, no attention
Intermediate	Listens, pays attention, does not ask any question
Good	Listens, pays attention, ask questions
Advanced	listens, pays attention, asks questions, cannot empathize
Expert	Listens, pays attention, asks clarifying questions, able to understand the message communicated
Acceptability to Learn	
Low	is not receiving to information
Average	receives information but resists to implement
Good , Above Average	receives information and implements per instructions
Strong	receives information and proactively implements and seeks feedback
Verbal Communication	
Beginner	Does not communicate, shy, low on confidence: has problem expressing in his/her native language or English language
Intermediate	Can communicate in native language, low confidence, shy, yet to try in English language

Good	Can communicate in native language, good confidence, tries to communicate in English language
Advanced	Can communicate in native language, express view points, good confidence, comfortable talking to people in the team, tries to communicate in English language as well
Expert	Can communicate in native language, express view points, very good confidence, can communicate with anyone without any fear, asks clarifying questions, communicates well in English, or tries hard to communicate in English language as well
Non-Verbal Communication	
Beginner	Struggles to understand the non-verbal cues, has to work on body language, has hard time understanding the written communication aspects
Intermediate	Can understand the non-verbal cues, has to practice, tries to apply written communication aspects
Good	Can understand non-verbal cues, practices well, works hard to get hold on written communication skills, exhibits confidence in whatever task is given
Advanced	Can understand non-verbal cues, can work on written communication aspects, exhibits confidence, practices well, help others to identify non-verbal cues
Expert	Can understand non-verbal cues, train others, confident, exhibits good non-verbal cues at all times, can train the pack, has good hold on written communication as well.
Comprehension	
Beginner	Tries to read the passage, has hard time to comprehend
Intermediate	Can read the conversation passage, has hard time understanding the regular passage
Good	Can read the conversation passage, regular passage, but stutters in answering questions if there are technical jargons
Advanced	Can read the conversation passage, comprehend but regular passage comprehension is good
Expert	Can read the conversation passage, comprehend but regular passage comprehension is good, explain better to others, help others, lead the pack
Writing Communication	
Beginner	Has trouble forming right sentences for written communication
Intermediate	Can form sentences, has problem with the layout, gets confused between layout for different form of written communication
Good	Can form sentences, has fair understanding of the layout to be used for particular type of written communication, but stutters for words and expression
Advanced	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well

Expert	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well and train others and lead the pack
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Recommended Learning Resources

<https://www.englishclub.com/grammar/parts-of-speech.htm>

Watch Amy Cuddy's TED Talk: [Your Body Language Shapes Who You Are](#)

Additional Reading: http://money.cnn.com/2000/05/03/career/q_body_language/

Pre-assessment:

Activity 1:

Make a group, read random words from the list, build sentence for few words from the list.

Create a group of 3 or 5 students. Randomly pick 5 words from the word list write down on the board/show them as a chart if you have created a word chart/make chit of words and ask them to pick one chit and READ the word.

Main idea: Testing the pronunciation ability, language ability, confidence in speaking, ability to understand and accept the instruction

Activity 2:

Simple reading test – Reading passages (Simple passage from the current course book)

Show the reading passage, let each one of them read 2 lines, after first student is done with reading two lines, then the next student must pick up from there and read next two lines. This process has to be followed until the entire class is done with reading or at least ten students are done with reading.

Main idea: Testing listening skills, attentiveness, language ability, pronunciation ability

Activity 3:

Students getting to know each other. Create a group of 3 or 5 students. Each student gets chance to talk to another student, introduce him/herself to the student, ask question, make a note of the answer against the name of the student who is answering the question on a sheet of paper.

Main idea: To assess current communication level, body language when students talk with each other, and confidence.

Commonly Used Word List

When	Today	For	Off	
Give	Stop	There	Often	
Again	Little	Than	Myself	
Do	Large	At	Over	
From	Both	Like	Along	
Him	Name	Said	Why	
Can	Few	They	Has	
Go	Home	Look	Bring	
But	Big	Know	Part	
Old	Should	Done	By	
Not	Once	High	As	
Her	Thought	So	Into	
Time	Better	Them	Away	
Long	Many	Does	No	
Had	Get	Always	Other	
Word	Please	These	With	
Very	Ask	Last	An	
Your	Say	Got	What	
Make	Ten	Next	Come	
Day	I	Those	Would	
Each	Show	Play	Who	
Yes	To	Girl	This	
On	Am	A	Could	
Been	Where	You	Now	
Of	Way	Be	Fun	
He	Which	Were	Only	
It	Write	Or	Much	
More	Goes	One	Tell	
My	Great	All	Out	
Any	Number		That	Fast
Their	First	Cat	Is	
We	Find	His	Small	
She	Me	Have	Dog	
Did	In	How	See	
Went	Before	Water	Here	
Full	Saw	And	People	
Some	Never	Use	School	
Then	Boy	Take	Two	
If	Right	The	Call	
Night	After	Will	Might	
Made	About	Was	May	
Up	Far	Are	Walk	

To assess current communication skill: Activity based

Activity 3:

Making a group of students and getting to know each other with a predefined expectation for example:

Name:

I have performed on stage:

I'm good at sports:

I can speak more than 3 languages:

I'm always cheerful:

I like my mother tongue:

Course Assessment and Evaluation**Continuous Internal Evaluation (CIE)**

Sl.No	Assessment	Schedule	Duration	Max. Test marks
1	Skill Test 1	At the end of 3 rd week of the sem	2 Hrs	20
2	Skill Test 2	At the end of 7 th week of the sem	2 Hrs	20
3	Skill Test 3	At the end of 13 th week of the sem	2 Hrs	20
Total				60

Scheme of Valuation for CIE

Serial no	Assessment	Marks
1	Portfolio Evaluation of activities / exercises conducted upto the schedule of Skill Test. (Work Book Based)	10
2	Assessment of any one through qualitative assessment (Rubrics)	10
	TOTAL	20

RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks)
(Qualitative Assessment)

Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
	2	4	6	8	10	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
Average / Total Marks:						

<p align="center">Example Only</p> <p align="center">RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks)</p> <p align="center">Faculty need to develop appropriate rubrics as per the assigned activity for assessment</p>						
Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
	2	4	6	8	10	
Language Basics	Doesn't know / understand	Can read and identify commonly used words	Confident , able to communicate well with known people	Confident , able to communicate well with anyone using a English	Can read, understand; Also comprehend & can train others	8
Reading	Beginning to read, has native language impact	Can read, identify words, build simple 3/4/5 letter words easily	Can read, understand, build words, read simple sentences ; Also comprehend	Can read, understand, build words, read simple sentences ; Also comprehend	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words	6
Inter personal communication	Is shy, doesn't talk/express	Hesitates to communicate – due to lack of confidence / ability, can talk to known people	Can talk to unknown people, less confident, does not express, has hard time working as a team	Can talk to unknown people, confident, can't express, has hard time working as a team	Confident, can talk to anyone, express well, works well in the team	8
Body language	Is shy, not open to communicate, has hard time making friends	Knows basics of Body language, practices sometimes	Knows basics of Body language, practices most times, has less confidence in presenting content	Knows and practices good body language all times, can present content	Knows and practices good body language all times, is an example, Leads the pack to get better	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8 marks

Scheme of Valuation for Semester End Examination (SEE)

Serial no	Assessment	Evidence	Marks	Conversion
1	Portfolio Evaluation- UNIT 1: English – Introduction	Work Book	15	40 Marks
2	Portfolio Evaluation- UNIT 2: Communication	Work Book	15	
3	Portfolio Evaluation- UNIT 3: Verbal Communication	Work Book	15	
4	Portfolio Evaluation- UNIT-4: Non-Verbal Communication:	Work Book	15	
5	Portfolio Evaluation- UNIT-5: English - Reading Skills, Grammar & Vocabulary	Work Book	15	
6	Any one activity through communication tools- By qualitative assessment (Rubrics).	BTE Answer scripts	25	
	TOTAL		100	

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20ME12P	Semester	I/II
Course Title	Computer Aided Engineering Drawing	Course Group	Mechanical and Allied courses
No. of Credits	4	Type of Course	Lecture & Practice
Course Category	PC	78Hrs Per Semester (L:T:P)= 1:0:2	6Hrs Per Week
Prerequisites	Enthusiasm to learn the subject/Visualizing/Creativity	Teaching Scheme	Practical
CIE Marks	60	SEE Marks	40

1. COURSE RATIONALE:

Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

2. LIST OF COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

1. Prepare engineering drawings both manually and using CAD with given geometrical dimensions using prevailing drawing standards and drafting instruments.
2. Visualize the shape of simple object from orthographic views and vice versa

3. COURSE OUT COMES:

C01	Able to use drawing instruments and Adopt the standards, dimensioning and construct appropriate drawing scales, in technical drawing development.
C02	Able to draw the projections of objects in all planes and learn displaying techniques for graphical communication in design process.
C03	Able to Sketch orthographic projections into isometric projections and vice versa.
C04	Use computer software and Apply computer aided drafting tools to create 2D /3 D engineering drawings

4. INSTRUCTIONAL STRATEGY:

1. Teacher should show model of real of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet.
2. Focus should be on proper selection of drawing instruments and their proper use.
3. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings.
4. Separate labs for practice on Engineering graphics Software should be established.

5-a CONTENTS:

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

5-b COURSE CONTENT DETAILS:

Unit	Major Learning Topics and Sub- Topics	Outcomes (in cognitive domain)	Hours L-T-P
UNIT-1 Basic elements of Drawing	1.1 List the different drawing instruments and application 1.2 Convention of lines and its application (Thick, Thin, Axis etc.,) 1.3 Practice use of drawing instruments 1.4 Representative fraction 1.5 Scales - Full Scale, Reduced Scale and Enlarged Scale 1.6 Dimensioning a. Aligned system and Unidirectional system in the Sketches b. Chain dimensioning and Parallel dimensioning 1.7 Construct different polygons	1. Drawing equipments, instruments and materials. 2. Equipments-types, specifications, method to use them, applications. 3. Instruments-types, specifications, methods to use those and applications. 4. Pencils-grades, applications, Different types of lines. 5. Scaling technique used in drawing. 6. Dimensioning methods.- Aligned method. Unilateral with chain, parallel dimensioning. 7. Constructions of geometrical figures	4-0-8
UNIT-2 Introduction to Projections	2.1 Introduction to Projections-Principle Planes of Projection and Principle Views 2.2 Introduction to First angle and Third angle method, their symbols 2.3 Projection of points in All 4 Quadrants	1. Reference planes, orthographic projections. 2. Concept of quadrant, 1st angle and 3rd angle projection and their symbols. 3. Projection of points.	8-0-16
	2.4 Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another	1. Projection of lines determination of true length and inclinations for following cases. (a) Line parallel to one or both the plane. (b) Line perpendicular to one of the plane. (c) Line inclined to one plane and parallel to another.	
	2.5 Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two b) Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP)	1. Projection of Planes. (a) Types of planes. (b) Projection of planes parallel to one of the reference planes. (c) Projection of plane inclined to one reference plane and perpendicular to another. Note: <i>Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.</i>	

	2.6 Projection of Solids for the above conditions	1. Projections of solids in various positions with respect to the reference planes. (Parallel, perpendicular and inclined to HP and / or VP.)	
UNIT-3 EXPOSURE TO CAD	<p>3.1 Introduction to CAD- Hardware requirements.</p> <p>3.2 Various CAD software available</p> <p>3.3 Familiarization of CAD window - Commands like New file, Saving the file, Opening an existing drawing file, Creating templates</p> <p>3.4 Setting up new drawing: Units, Limits, Grid, Snap. Standard sizes of sheet.</p> <p>3.5 Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview</p> <p>3.6 Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text</p> <p>Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear</p> <p>3.7 Insert title block for the drawing and take the Print out</p> <p>3.8 Create objects by applying constraints and convert the objects to full scale , reduced scale and enlarged scale</p> <p>3.9 Apply copy, mirroring, array, fillet and trim on the object created</p>	<p>1. Computer graphics & its terminology.</p> <p>2. CAD definition, concept & need.</p> <p>3. Commands used in CAD</p> <p>4. Functional areas of CAD. - Coordinate systems.</p> <p>5. Familiarization of Cad commands</p> <p>6. Draw simple Geometrical figures using CAD</p>	3-0-6

UNIT-4 Orthographic projections	4.1 Introduction to orthographic, Isometric projections 4.2 Conversion of pictorial view into Orthographic Views (USING SKETCH BOOK AND CAD)	1. Types of projections-orthographic, isometric projections: concept and applications. 2 Various term associated with orthographic projections. (a) Theory of projection. (b) Methods of projection. (c) Orthographic projection. (d) Planes of projection. 3. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. Note : (1) Problem should be restricted up to - Front view/Elevation, Top view/Plan and Side views only. Use First Angle Method only.	2-0-4
UNIT-5 Isometric projections	5.1 Introduction to Isometric Projections 5.2 Isometric Scales and Natural Scale 5.3 Isometric View and Isometric Projection 5.4 Conversion of Orthographic Views into Isometric (USING SKETCH BOOK AND CAD)	1. Isometric axis, lines and planes. 2. Isometric scales. 3. Isometric view and isometric drawing. 4. Difference between isometric projection and isometric drawing. 5. Illustrative problems limited to Simple elements	2-0-4
UNIT-6 CAD Drafting	6.1 Draw different types of 2D/3D modeling entities using viewing commands, to view them (Problems solved in chapter no 3 and 4 i.e Orthographic, isometric projection). 6.2 2D/3D modeling for Thread profiles,nuts,bolts,studs,setscrews,was her,Locking arrangements. (USING CAD)	1 Difference between 2D & 3D models. 2.2D/3D modeling – concept, Simple objects	7-0-14
		TOTAL	26-0-52

6. LIST OF PRACTICAL EXERCISES:

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sl. No	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	1	1. Teacher will demonstrate a: Use of a. Drawing instruments. b. Planning and layout as per IS. c: Scaling technique.	1-0-2

		2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.(Drawing sheet)	
		Problem – 2 Indicate different convention of lines on the drawing. .(Drawing sheet)	1-0-2
		Problem – 3 Copy the sketch to the required scale and dimensioning adopting right system and positioning of dimensions using Tee and Set squares / drafter.(Drawing sheet)	1-0-2
		Problem 4. Draw regular geometric constructions Pentagon, Hexagon, Square, circle, Triangle and other shapes. .(Drawing sheet)	1-0-2
		First angle Projection symbol Problem 5: Draw Projection of points in 1 ^s , 2 nd , 3 ^d and 4 Quadrants.(Drawing sheet)	2-0-4
		Problem 6: Draw Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another. .(Drawing sheet)	1-0-2
		Problem 7: Draw Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two (Resting on Edge, Corner, Inclined to HP And VP)	1-0-2
		Problem 8: Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheets)	1-0-2
2	2	Problem 9: Draw Projection of Solids for the above conditions (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheet)	3-0-6
		Use of CAD commands , plotting the drawing	1-0-2
		Problem 10:Drawing basic entities : Circle, Arc, Polygon, Ellipse, Rectangle, Multiline	1-0-2
		Applying constrains draw basic entities Insert title Block (CAD Drawings and Printout)	1-0-2
4	4	Problem 11: Draw Orthographic views for the given object. (Sketch book and CAD Drawing)	2-0-4
5	5	Problem 12: Draw Isometric projections for the given Orthographic views (Sketch book and CAD Drawing)	2-0-4
		Problem 13:Produce Orthographic (2D) Drawings in CAD-Chap 3 Problem 14:Produce Isometric and 3D Drawings in CAD – Chap 4(CAD Drawings and Printout)	5-0- 10
6	6	Problem 15:create 3D models of Mechanical Elements such as Hexagonal headed bolt, Simple toy, ball bearing (CAD Drawings and Printout)	2-0-4
		TOTAL	26-0-52

Note: Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.

- 1 Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
- 2 The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.
- 3 The sketchbook has to contain data of all problems, solutions of all problems and student activities performed.
- 4 Students' activities are compulsory to be performed. A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.
- 5 End Semester Examination will be conducted in practical mode for 100marks and weightage is reduced for 40 marks.
- 6 Students are to be assessed for competencies achieved.

7.SUGGESTED LIST OF STUDENT ACTIVITIES:

SL.NO.	ACTIVITY
1	Sketch the combinations of set squares to draw angles in step of 15°. (15°, 30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, 180°).
2	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
3	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
4	List at least two questions individually which you would like to ask for followings:
5	Prepare a 2D drawing using AutoCAD and 2D parametric sketcher environment.
6	Prepare 3D solid models using AutoCAD any one mechanical component (Four components).

8. SUGGESTED LEARNING RESOURCES:

1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46*. BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujarat 2010; ISBN: 978-93-80358-17-8.
3. Jain & Gautam, *Engineering Graphics & Design*, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapooan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.

10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

9. SOFTWARE/LEARNING WEBSITES :

1. <https://www.youtube.com/watch?v=TJ4jGyDWCw>
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. <https://www.youtube.com/watch?v=MQScnLXL0M>
4. <https://www.youtube.com/watch?v=3WXPanCq9LI>
5. <https://www.youtube.com/watch?v=fvjk7PlxAuo>
6. <http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf>
7. <https://www.machinedesignonline.com>

10. Mapping of Course Outcomes with Programme Outcomes (Suggestive only):

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Engineering Graphics	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped Method is to relate the level of PO with the number of hours devoted to the CO s which maps the given PO. If $\geq 50\%$ of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 3 If 30 to 50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 2 If 5 to 30% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 1 If $< 5\%$ of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is considered not mapped i.e. Level 0								

11. COURSE ASSESSMENT AND EVALUATION CHART:

Sl. No	Assessment	Time frame in semester	Duration	Max marks	Conversion
1.	Portfolio Evaluation of Drawings(Manual Drawings - drawing sheet mode)	Semester	-	20	20
2	Skill Test-1 (unit 1 and 2- Manual based)	At the end of 6 week	3 Hrs	100	Skill tests-1 is to be reduced to wieghtage of 20
3	Skill Test-2 (Skill test 2 is of CAD based from Unit 4,5)	At the end of 9 week	3 Hrs	100	Average of two skill tests 2 and 3 (Both skill tests are to
4	Skill Test-3	- At the end of 13 week	3 Hrs	100	

	(Skill test 3 is CAD based-Unit 6)				be reduced to wieghtage of 20 indepen dently) 20
5	Total Continuous Internal Evaluation (CIE) Assessment			60	
6	Semester End Examination(SEE) Assessment conducted for 100 marks, finally reduced to 40 marks wieghtage	3 Hrs	100	40	
	TOTAL				100

Scheme of Valuation for End Examination

SL NO	QUESTIONS	MARKS
1.	One Problems from Geometrical constructions/Projection of points (Answer Sheet)	25
OR		
	One Problems from Projection of lines (Answer Sheet)	25
2.	One Problems from Projection of planes (Answer Sheet)	25
OR		
	One Problems from Projection of solids (Answer Sheet)	25
3	Create 3D drawing for the given Sketch and Dimensioning(CAD)	40+10=50
	TOTAL	100

12.CAD Laboratory and Other Requirements to Conduct Engineering Graphics Course

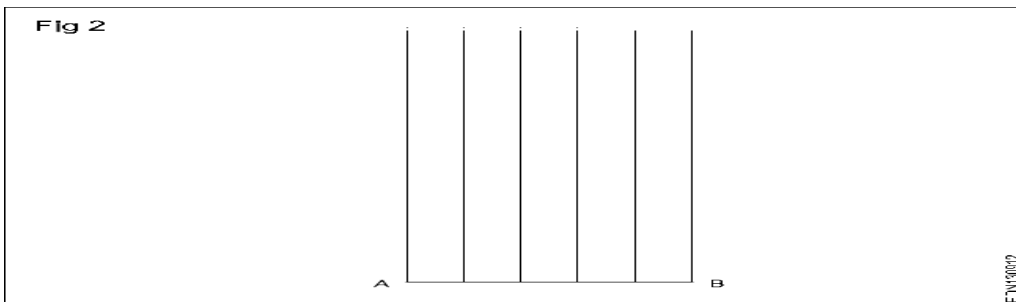
1. Latest Configuration Computers which can be able to run latest any Computer Aided Drafting Software. (At least One Computer per student in practical session.)-20 no
2. Any latest Authorized Computer Aided Drafting Software (20 user licenses)
3. Plotter of size A2/A3
4. LCD Projector

MODEL QUESTION BANK (Suggestive only)

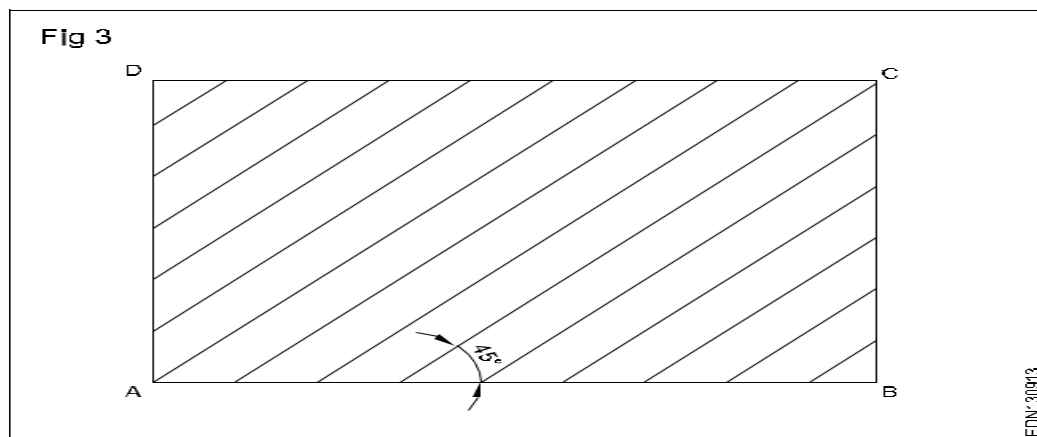
1. a) Illustrate the elements of dimensioning with the help of a sketch.
b) Illustrate the dimensioning of given common features: diameter, radius, chord, Arc and angle.
2. a) Mention the uses of the following drawing instruments.
i) T-square ii) Set square iii) Bow compass iv) Clinograph v) Minidrafter
b) Mention the uses of the following drawing instruments.
i) French curves ii) Protractor iii) Clips iv) Erasing Shield v) Drafting machine
3. Define RF. Mention the types of scales based on RF.
4. Draw the conventional representation of lines
5. Draw six horizontal parallel lines of 50 mm long with 10 mm intervals (Fig 1).



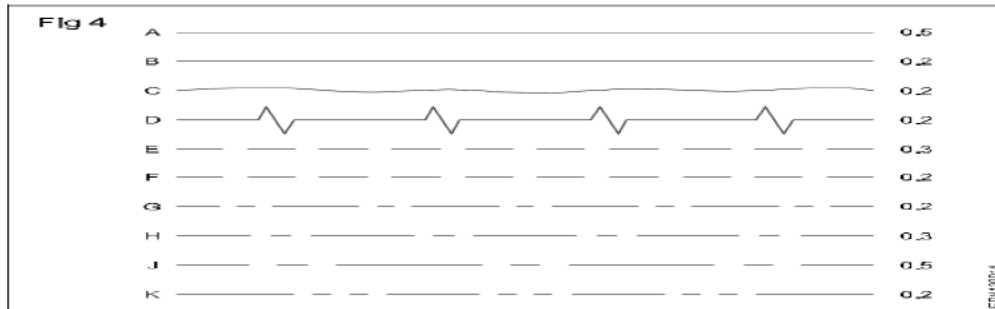
6. Draw six vertical parallel lines of 50 mm length with 10 mm intervals (Fig 2)



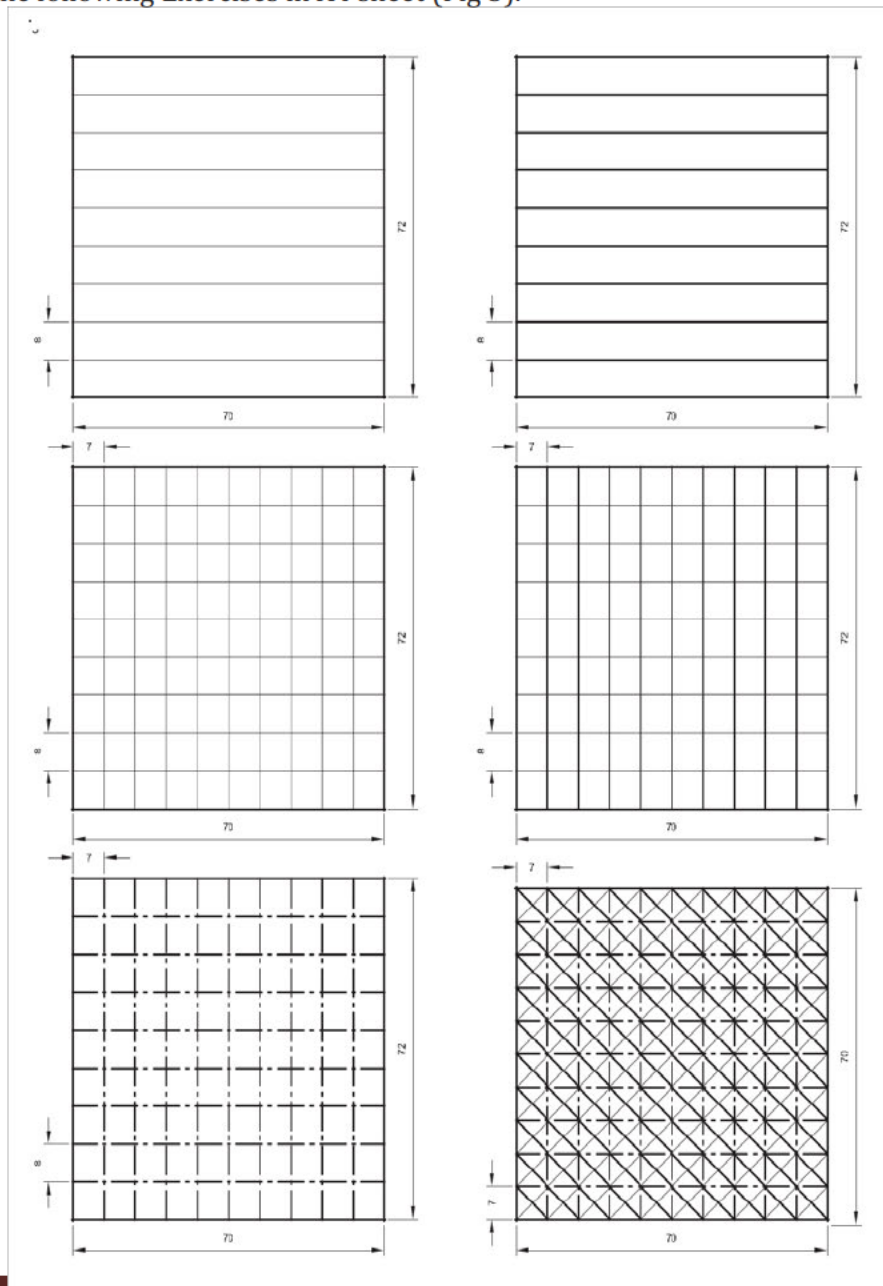
7. Draw 45° inclined lines (Fig 3).



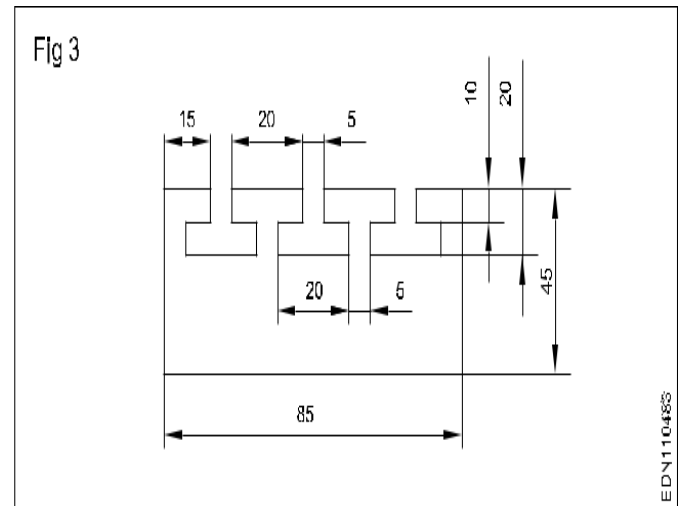
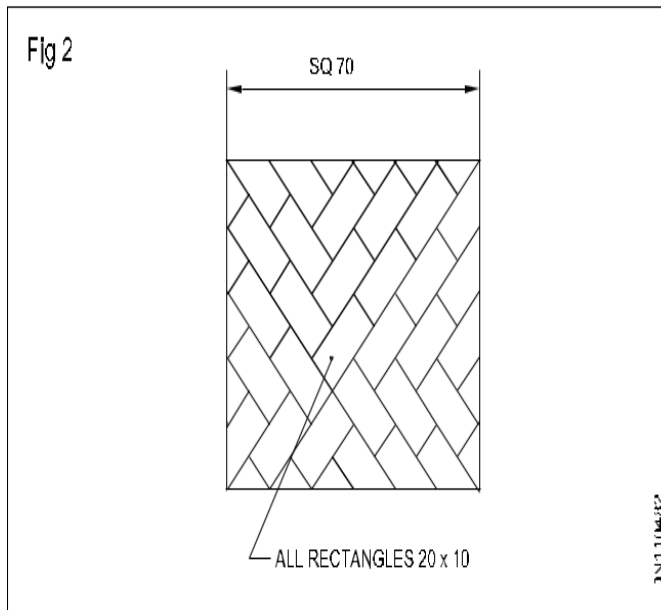
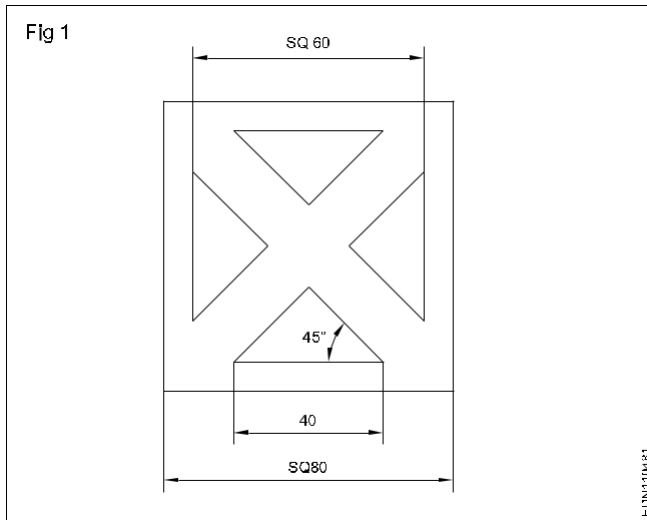
8 Draw the given types of lines using 0.5 range thickness of line according to the specification (Fig 4)



Draw the following Exercises in A4 sheet (Fig 5).



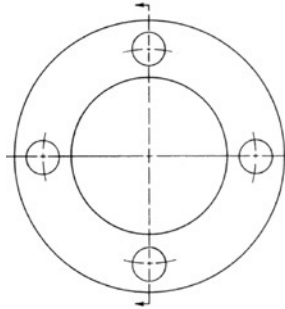
10 Draw the pattern drawing given Figure1,2,3



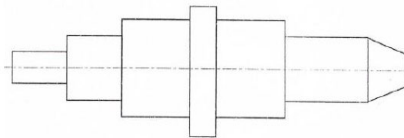
11 a) Illustrate the elements of dimensioning with the help of a sketch.

b) Illustrate the dimensioning of given common features: diameter, radius, chord, Arc and angle.

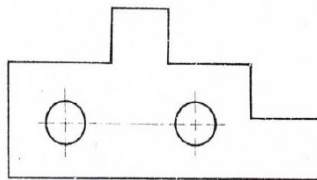
12 Copy the sketch to 1:1 scale and dimension it using Aligned system.



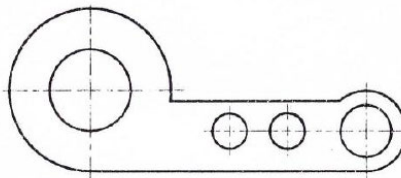
13 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Parallel dimensioning method.



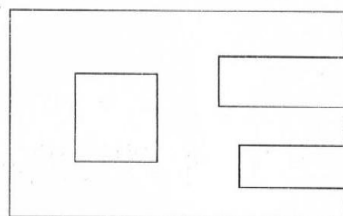
14 Copy the sketch to 1:1 scale and dimension it using Aligned system with Chain dimensioning method.



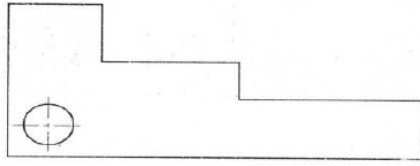
15 Copy the sketch to 1:1 scale and dimension it using Aligned system with Parallel dimensioning method.



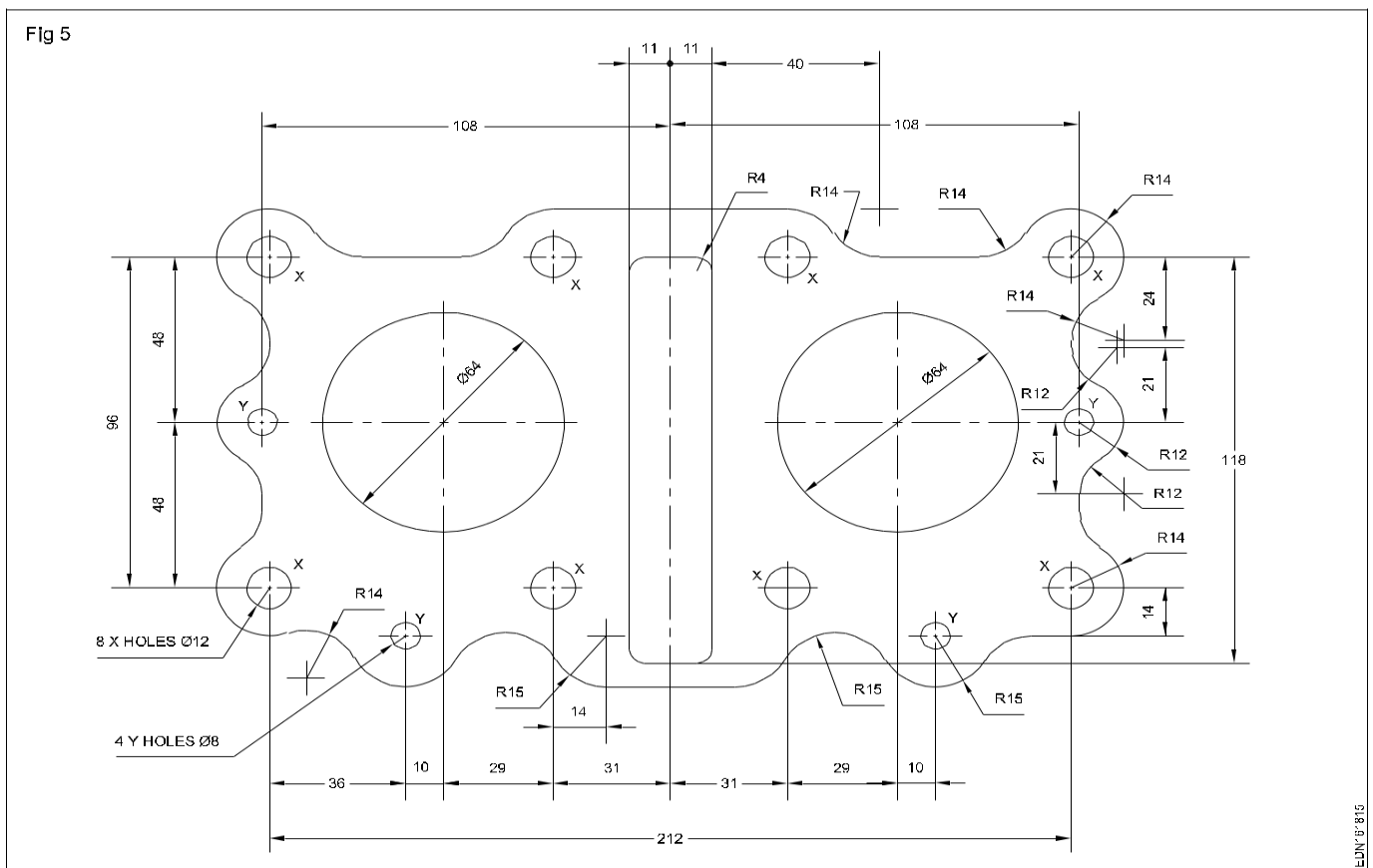
16 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Chain dimensioning method



17 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Parallel dimensioning method.



15 Copy the sketch as shown in figure below dimension it in a Chain and parallel dimensioning



UNIT 2 PROJECTIONS

PROJECTIONS OF POINTS

Draw the symbolic representation of First and Third angle projection method.

1. Draw the projections of the following points:
 - i. A is 25mm above the HP and 30mm in front of the VP.
 - ii. B is lying on HP and 45mm in front of VP.
 - iii. C is lying on VP and 50mm above HP.
 - iv. D lies in both HP and VP.
2. A point P is 40 mm in front of VP; 50 mm above HP and 30 mm in front of left PP. Draw the three principal views of the point.
3. A point Q is 30mm in front of VP, 40mm above HP and 35mm in front of right PP. Draw the three principal views of the point.
4. Draw the projections of the following points on a common reference line:
 - a) Point P is 25mm above the HP and 40mm behind the VP
 - b) Point Q is 30mm below the HP and 40mm behind the VP
 - c) Point R is 25mm above the HP and in the VP.
 - d) Point S is 30mm below the HP and in the VP
 - e) Point T is 35mm in front of the VP and in the HP.

PROJECTIONS OF LINES

1. Draw the three views of a line 70mm long when it is parallel to both HP and VP.
The line is 20mm in front of VP and 30mm above HP.
1. Draw the three views of a line 80mm long is perpendicular to VP and parallel to HP. The end nearer to VP is 20mm above HP and 25mm in front of VP.
2. Draw the projections of a line 80mm long placed parallel to VP, perpendicular to HP. The line is 70mm in front of VP and 60mm in front of right PP. the lower end of the line is 30mm above HP. (Ref: KRG Ed 2018 P151)
3. Draw the projections of a line 80mm long placed parallel to HP, perpendicular to VP with the rear end of the line 30mm in front of it. The line is 55mm above HP and 50mm in front of the right PP. (Ref: KRG Ed 2018 P152)
4. Draw the three principal views of a line 80 mm long placed parallel to VP and perpendicular to HP. The line is 70mm in front of VP and 60mm in front of right PP. The lower end of the line is 30mm above HP.
5. Draw the three principal views of a line 80 mm long when it is placed parallel to both HP & VP. One of the ends of the line is 70 mm above HP, 60 mm in front of VP and 30mm in front of the right PP.
6. A line AB 80 mm long is inclined at 30° to HP and parallel to VP. The line is 90 mm in front of VP. The lower end A is 35 mm above HP, 110 mm in front of the right PP and is away from it than the higher end. Draw the three principal views of the line.
7. Draw the projections of a line AB, 80 mm long inclined at 30° to HP and parallel to VP. The line is 40 mm in front of VP. The lower end A is 20 mm above HP.

PROJECTIONS OF PLANE SURFACE

1. A regular triangular lamina of side 30mm is placed with one its corner on HP such that the surface is inclined at 40° to HP and perpendicular to VP. Draw its Top and Front views.
2. A regular square lamina of side 40mm is placed with one its side on HP such that the surface is inclined at 30° to HP and perpendicular to VP. Draw its Top and Front views.
3. A regular pentagonal lamina of side 30mm is placed with one its side on HP such that the surface is inclined at 45° to HP and perpendicular to VP. Draw its Top and Front views.
4. A regular hexagonal lamina of side 30mm is placed with one its corner on HP such that the surface is inclined at 45° to HP and perpendicular to VP. Draw its Top and Front views.
5. A circular lamina of 40mm diameter lies on HP such that its surface is inclined at 40° to HP. Draw its front and top.
6. An equilateral triangular lamina of side 40mm rests with one its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
7. An equilateral triangular lamina of sides 30mm is resting with one of its corners on HP. The surface of the lamina is inclined at 45° to HP and the side opposite to the corner on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
8. A square lamina of 40mm side rests with one of its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the top and front views of the square lamina in this position.
9. A square lamina of 40mm sides rests with one of its corner on HP. The diagonal passing through this corner is inclined at 45° to HP and appears to be inclined at 45° to VP. Draw its projections.

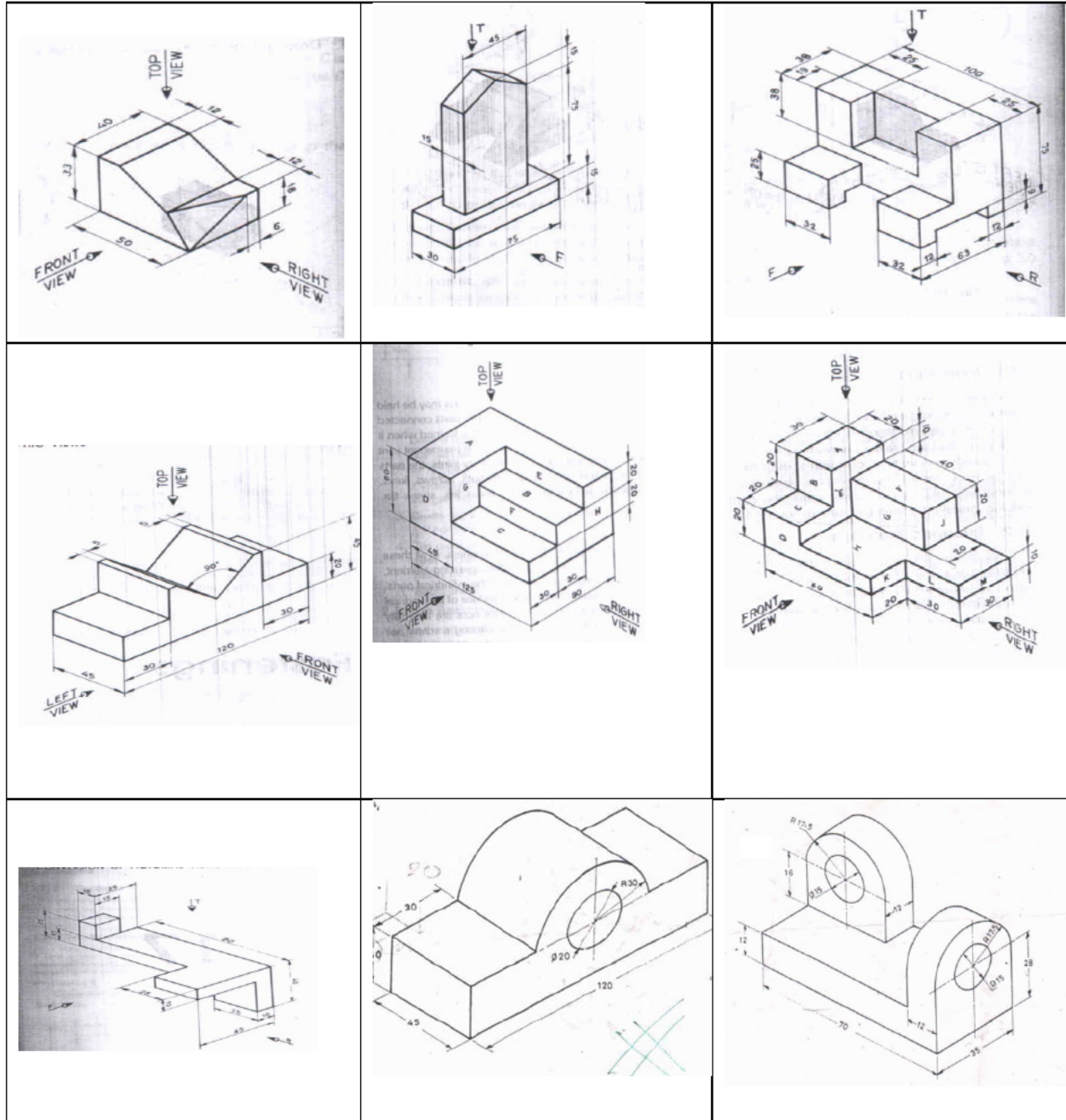
PROJECTIONS OF SOLIDS

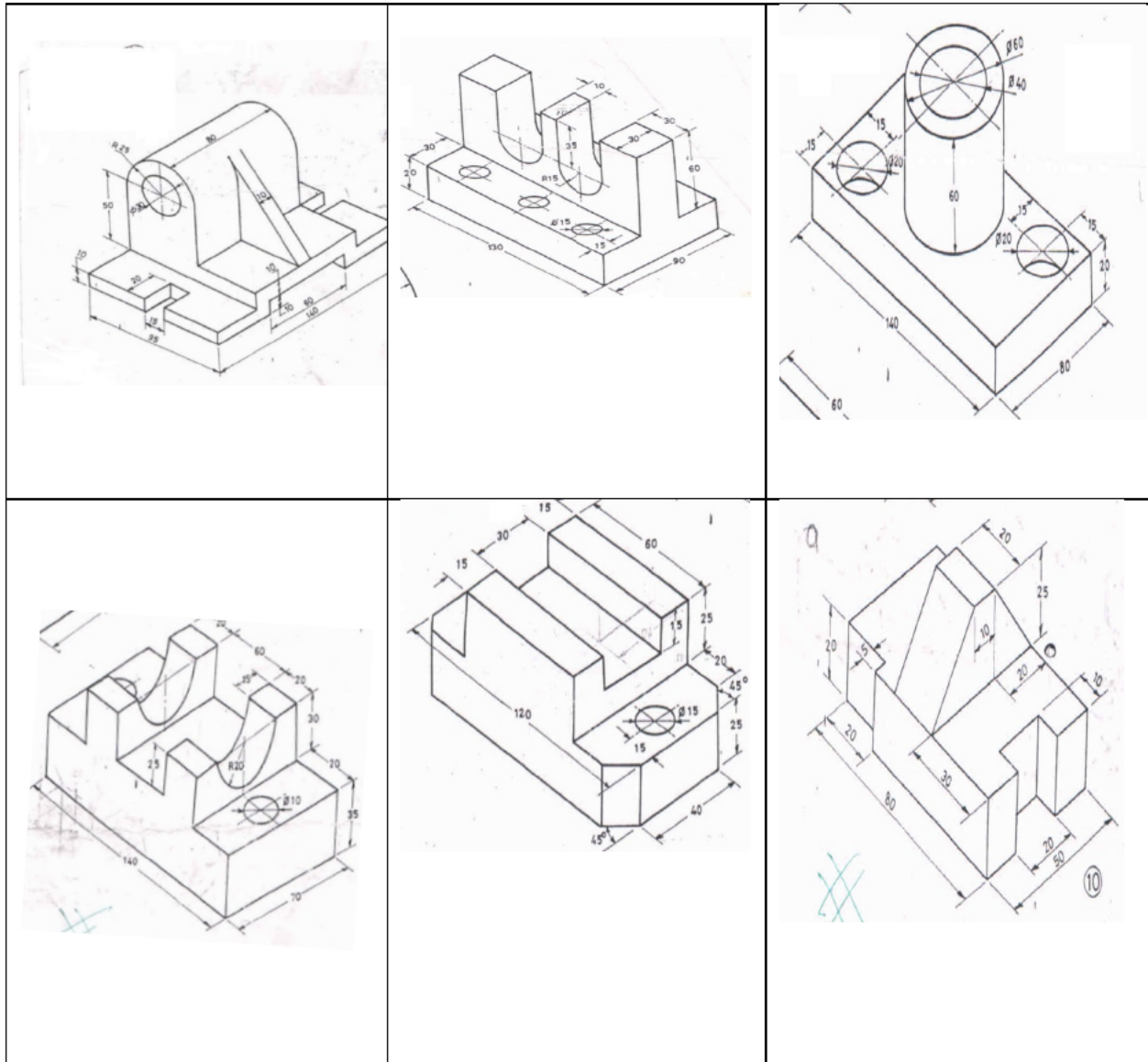
1. A triangular prism of base edge 40mm and height 65mm rests with one of its base edges on HP so that the axis of the prism is inclined at 30° with HP. Draw the top and front views when the axis of the prism is parallel to VP.
2. A square prism of base edge 40mm and height 70mm rests with one of its base edges on HP. The axis of the prism is inclined at 45° to HP and parallel to VP. Draw the top and the front views of the prism.
3. A pentagonal prism of base 35mm and height 60mm has its base edge on HP. Draw the top and front views, if the base of the prism is inclined at 30° to the HP. The axis of the prism is parallel to the VP.
4. A Hexagonal prism of base 35mm and height 60mm is resting with its base edge on HP so that the axis is inclined at 45° and parallel to VP. Draw its top and front views.
5. A triangular pyramid of base edge 40mm and height 65mm is resting with one of its base corner on HP so that the axis of the pyramid is parallel to VP and inclined at 45° to HP. Draw the top and front views.
6. Draw the top and front views of a hexagonal pyramid resting with one of its base corner on HP such that the axis of the pyramid is inclined at 30° to HP. The hexagonal pyramid has its base edges as 30mm and axis height as 60mm.
7. A pentagonal pyramid of base edge 30mm and axis height 65mm rests with one of its base corners on HP so that the base of the pyramid is inclined at 45° to the HP. Draw the projections if the axis of the pyramid is parallel to the VP.

8. A cylinder of 40mm diameter and axis height 65mm rests with its points of the circumference on HP so that the axis is inclined at 45° to the HP and parallel to the VP. Draw the top and front views.
9. A cone of 40mm diameter and axis height 65mm is resting with points of the circumference on HP. Draw the top and front views, if the axis of the cone is inclined at 30° with HP and parallel to VP.

UNIT 3 ORTHOGRAPHIC REJECTIONS

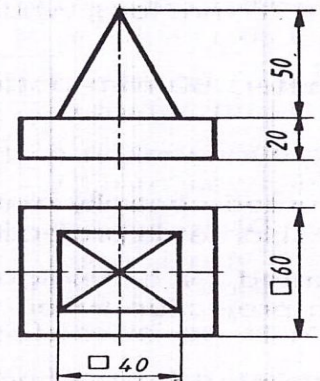
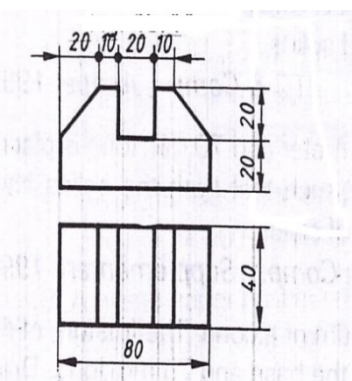
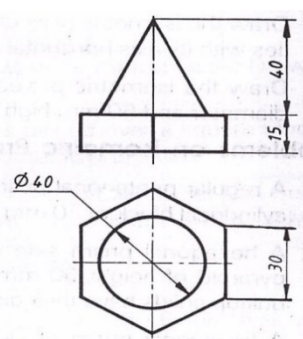
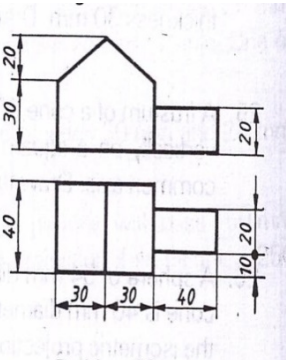
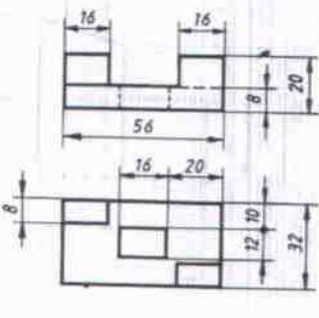
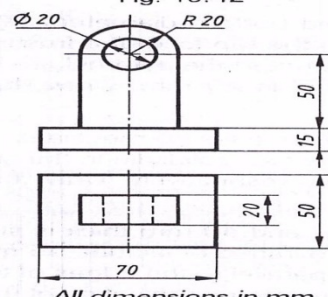
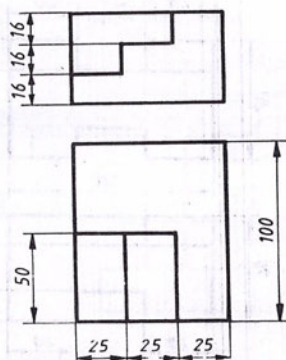
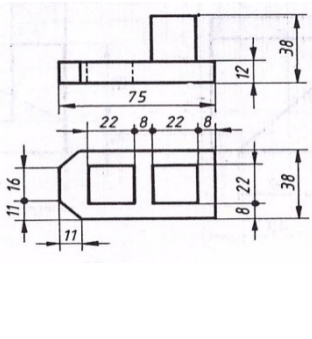
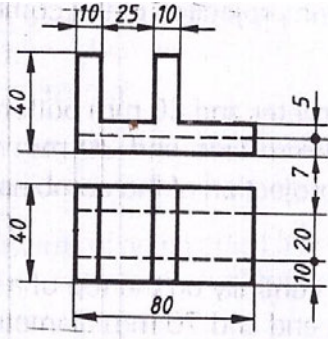
Draw the three principal views of the component as shown in the figure.



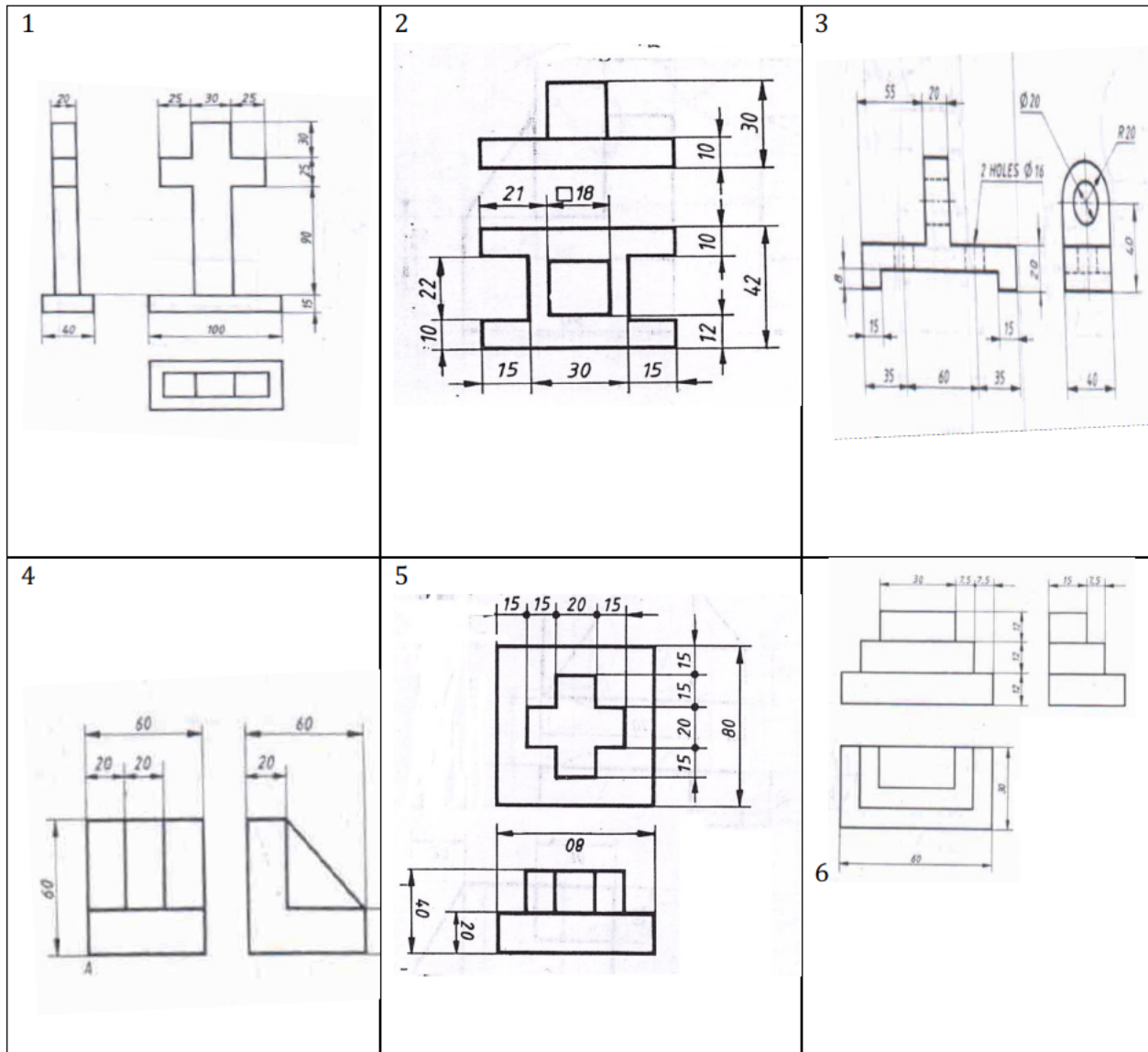


UNIT 4 ISOMETRIC PROJECTIONS

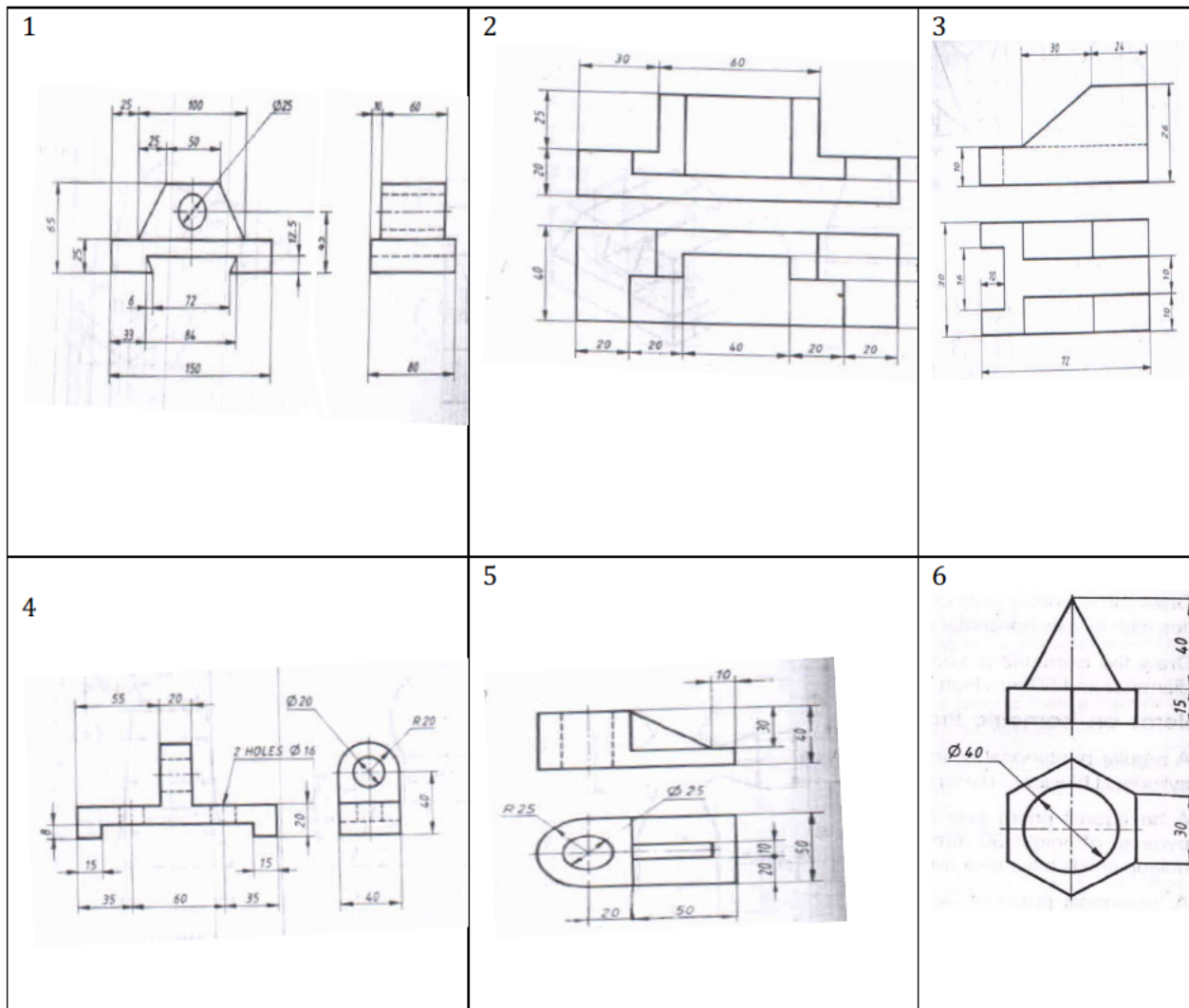
1. Draw the isometric view of the machine component whose orthographic views are given below:

<p>1.</p> 	<p>2.</p> 	<p>3.</p> 
<p>4.</p> 	<p>5.</p> 	<p>6.</p>  <p>All dimensions in mm</p>
<p>7.</p> 	<p>8.</p> 	<p>9.</p>  <p>All dimensions in mm</p>

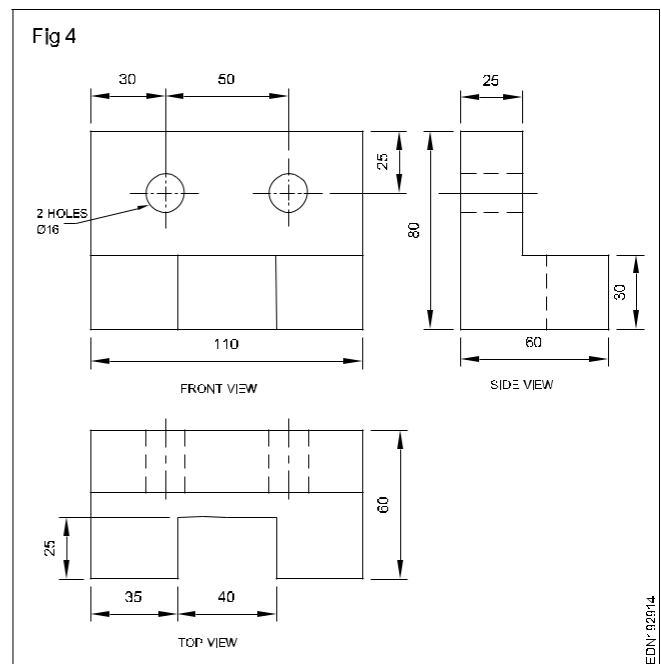
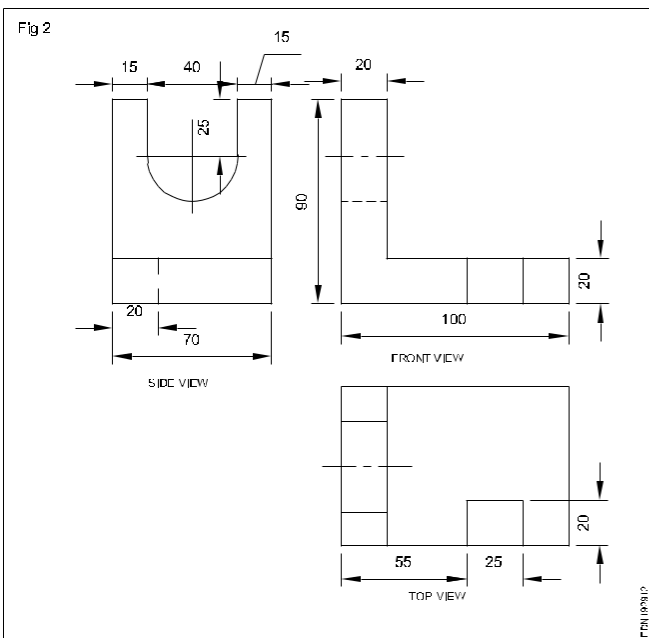
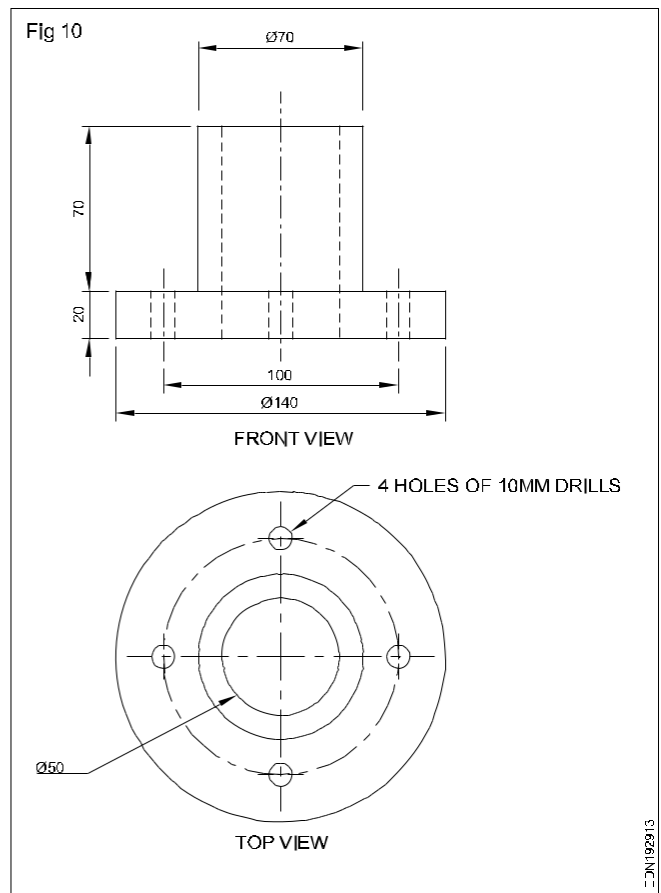
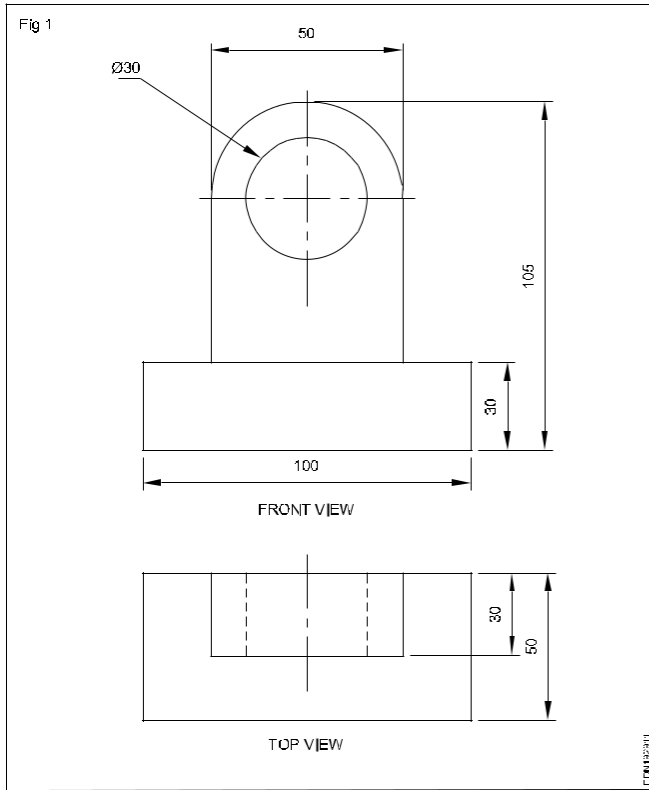
2. Draw the isometric Projection of the machine component whose orthographic views are given below:



3. Draw the isometric Projection of the machine component whose orthographic views are given below



4. Create 3D model using CAD of the machine component whose orthographic views are given below



Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20AU01T	Semester	I
Course Title	ENVIRONMENTAL SUSTAINABILITY	Course Group	Audit
No. of Credits	2	Type of Course	Lecture
Course Category	AU	Total Contact Hours	2Hrs Per Week
			26Hrs Per Semester
Prerequisites	Basic Environmental Science	Teaching Scheme	(L: T:P) = 2:0:0
CIE Marks	50	SEE Marks	No

COURSE OBJECTIVES:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. Solve various engineering problems applying ecosystem to produce eco – friendly products.
2. Use relevant air and noise control methods to solve domestic and industrial problems.
3. Use relevant water and soil control methods to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

COURSE OUTCOMES:

At the end of the course student will be able to know :

C01	Importance of ecosystem and terminology.
C02	The extent of air pollution, effects, control measures and acts.
C03	The extent of noise pollution, effects, control measures and acts.
C04	The water and soil pollution, effects, control measures and acts
C05	Different renewable energy resources and efficient process of harvesting.
C06	Solid Waste Management and Environmental acts.

COURSE CONTENT:

Marks: 15	Unit-1 Ecosystem	Allotted Hrs: 03
Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, Green House Effect, Ozone depletion.		
Marks: 20	Unit-2 Air Pollution	Allotted Hrs: 03
Air pollution, Natural and manmade sources of air pollution, Effects of air pollution. Air Pollutants and Types. Control of air pollutants by Cyclone separator and Electrostatic Precipitator, Air (prevention and control of pollution) act 1981		
Marks: 10	Unit-3 Noise Pollution:	Allotted Hrs: 02
Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000		
Marks: 20	Unit- 4 Water and Soil Pollution:	Allotted Hrs: 06
Water pollution and Sources of water pollution, Types of water pollutants, Characteristics of water pollutants, control measures of water pollution. Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974, Water conservation – Importance of Rainwater Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides		
Marks: 20	Unit-5 Renewable sources of Energy	Allotted Hrs: 07
<i>Solar Energy:</i> Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar water heater and Solar stills and their uses. <i>Biomass:</i> Overview of biomass as energy source. Thermal characteristics of biomass as fuel. <i>Wind energy:</i> Current status and future prospects of wind energy. Wind energy in India. Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy, Ocean energy resources, Tidal energy conversion.		
Marks: 15	Unit-6 Solid Waste Management and Environmental Acts	Allotted Hrs: 05
Solid waste generation, Sources and characteristics of Municipal solid waste, Solid Waste Management rules 2016- 3R in SWM. E- Waste generation, Sources and characteristics, E waste management rules 2016 Plastic Waste generation, Sources and characteristics, Recycled plastic rules 2016 Importance of Environment (protection) act 1986 Occupational health and safety measures.		

Unit No & Name	Detailed Course Content	CO	PO	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	C01	1,5,7	1
	Global warming - Causes, effects.	C01	1,5,7	2
	Green House Effect, Ozone depletion - Causes, effects	C01	1,5,7	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	C02	1,5,7	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	C02	1,5,7	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	C02	1,5,7	6
3. Noise Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	C03	1,5,7	7
	Effects and Control of Noise pollution.	C03	1,5,7	8
	Noise pollution (Regulation and Control) Rules, 2000	C03	1,5,7	8
4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	C04	1,5,7	9
	Control measures of water pollution.	C04	1,5,7	10
	Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974.	C04	1,5,7	11
	Water conservation – Importance of Rainwater Harvesting	C04	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	C04	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	C04	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy.	C05	1,5,7	15
	Solar collectors and advantages of Advanced solar collectors.	C05	1,5,7	16
	Solar water heater, Solar stills and their uses.	C05	1,5,7	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.			17
	Wind energy: Current status and future prospects of wind energy.	C05	1,5,7	18
	Wind energy in India.	C05	1,5,7	18
	Need of new Energy sources, Different type's new energy sources.	C05	1,5,7	19
6. Solid Waste Management and Environmental Acts	Environmental benefits of New Energy Sources-Hydrogen energy	C05	1,5,7	19
	Environmental benefits of New Energy Sources- Ocean energy resources	C05	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	C05	1,5,7	21
	Solid waste generation, Sources, Characteristics of solid waste	C06	1,5,7	22
	Solid Waste Management rules 2016	C06	1,5,7	22
	E- Waste generation Sources and characteristics,	C06	1,5,7	23
	E waste management rules 2016	C06	1,5,7	23
	Plastic Waste generation Sources and characteristics,	C06	1,5,7	24
	Plastic Waste Sources and characteristics	C06	1,5,7	24

	Recycled plastic rules 2016, Importance of Environment (protection) act 1986,	CO6	1,5,7	25
	Occupational health and safety measures.	CO6	1,5,7	26
Total				26

References:**(a) Suggested Learning Resources:****Books:**

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Wastewater Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
6. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N. Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New Delhi, 1988, ISBN: 0-07-451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
10. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
11. Metcalf & Eddy, Wastewater Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
12. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

- 1) www.eco-prayer.org
- 2) www.teriin.org
- 3) www.cpcp.nic.in
- 4) www.cpcp.gov.in
- 5) www.indiaenvironmentportal.org.in
- 6) www.whatis.techtarget.com
- 7) www.sustainabledevelopment.un.org
- 8) www.conserve-energy-future.com

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences

- Encouraging students to visit sites such as Railway station and research establishment around the institution.

Mapping of Course Outcomes with Programme Outcomes

CO	Course Outcome	PO Mapped	Cognitive Level R/U/A	Theory Sessions In Hrs	Allotted marks for CIE on cognitive levels		TOTAL
					R	U	
C01	Importance Of ecosystem and terminology	1,5,7	R, U	03	02	02	04
C02	The extent of air pollution, effects, control measures and acts.	1,5,7	R, U	03	03	02	05
C03	The extent of noise pollution, effects, control measures and acts.	1,5,7	R, U	02	03	02	05
C04	The water and soil pollution, effects, control measures and acts	1,5,7	R, U	06	03	02	05
C05	Different renewable energy resources and efficient process of harvesting.	1,5,7	R, U	07	03	02	05
C06	Solid Waste Management and Environmental acts.	1,5,7	R, U	05	02	04	06
Total Hours of instruction				26	30		

R-Remember; U-Understanding.

Level of Mapping PO's with CO's

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Environmental Science	C01	3	0	0	0	2	0	1
	C02	3	0	0	0	2	0	1
	C03	3	0	0	0	2	0	1
	C04	3	0	0	0	2	0	1
	C05	3	0	0	0	2	0	1
	C06	3	0	0	0	2	0	1
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped Method is to relate the level of PO with the number of hours devoted to the CO s which maps the given PO. If $\geq 50\%$ of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 3 If 30 to 50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 2 If 5 to 30% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 1 If < 5% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is considered not mapped i.e. Level 0								

Course Assessment and Evaluation Chart

Sl. No	Assessment	Duration	Max marks	Conversion
1.	CIE Assessment 1 (Written Test -1 - At the end of 3 ^d week	80 minutes	30	Average of three written tests 30
2.	CIE Assessment 2 (Written Test -2) - At the end of 7 week	80 minutes	30	
3.	CIE Assessment 3 (Written Test -3) - At the end of 13 week	80 minutes	30	
4	CIE Assessment 4 (MCQ/Quiz) - At the end of 5 week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Open book Test) - At the end of 9 week	60 minutes	20	
6	CIE Assessment 6 (Student activity/Assignment)- At the end of 11 week	60 minutes	20	
7.	Total Continuous Internal Evaluation (CIE) Assessment			50
Total Marks				50

Note:

1. Average marks of Three CIE shall be rounded off to the next higher digit.
2. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

MANDATORY STUDENT ACTIVITY: EACH STUDENT HAS TO SELECT ANY ONE OF THE LISTED

1. Students chose one thing to reduce at home each week and write journal entries about their successes and challenges implementing the change. In class, they form groups and create "Do You Know?" posters.
2. Students pretend they are architects and come up with a series of design changes to make their school more environmentally friendly. They then grade their projects according to a rubric.
3. A presentation for Green Team Club members to introduce themselves and the purpose of their club. They explain how to use their new recycling bins, in the classroom and in the cafeteria.
4. Ever wonder what's in your school's waste? This hands-on activity helps students assess their school's waste in order to think of ways to reduce it. The results can be incorporated into the school's recycling plan.
5. How do we measure climate change? What activities contribute to climate change?
6. 6. Start a compost or worm bin. Composting is a hands-on way to learn about important life science concepts such as ecosystems, food webs and biodegradation. Students experience how worms and other decomposers recycle fruits and vegetable scraps into compost. Use the

compost in your college garden! Have green team students make up a skit and present details about the new composting program to all classrooms. Have them make signs for the bins (compost, recycle, and landfill), monitor the waste collection at lunchtime, cart the food waste to the compost, and decide how and where the compost will be used.

7. Paint posters and decorate bulletin boards or the doors to the cafeteria with waste- free lunch messages to announce or support a waste-free event, and have students vote for their favorite poster.
8. Conduct a classroom audit to identify waste and look for ideas to reduce and reuse. Empower the student to set goals, search for solutions and review progress.
9. Go on a field trip. Visit your local landfill, recycling center, or a nearby composting facility where the students can see first-hand what is happening to waste and learn about the lifecycle of waste and its affect on the environment.
10. Home energy audit:Have students make a list of all the appliances and light bulbs in their house. How much energy does their house use if all the lights are on for 4 hours per day? If their appliances are on for 2 hours per day? How much energy could they save if they switched to energy-efficient appliances or lightbulbs?
11. Use recycled material in art projects:Recycled materials can make beautiful art projects such as jewelry, planters, and bird houses. Incorporating materials that would otherwise be thrown away into art projects can show your students how to find new uses for these items.
12. Life cycle :One way to show students what happens when you put something in the trash versus recycling or reusing the object is to do a life cycle analysis. This is a flow chart that shows the environmental impacts of an object, from extracting the raw materials to decomposition and everything in between. When something is put in the trash instead of being reused or recycled, the life cycle assessment will show a bigger environmental impact. When something is reused or recycled, the environmental impact is less because raw materials don't need to be extracted to create something new.

Model Question Paper
I A Test (CIE)

Programme	:		Semester: I			
Course	:		Max Marks : 30			
Course Code	:		Duration : 1 Hr 20 minutes			
Name of the course coordinator:			Test : I/II/III			
Note: Answer one full question from each section. One full question carries 10 marks.						
Qn.No	Question	CL	CO	PO	Marks	
Section-1						
1.a)						
b)						
c)						
2.a)						
b)						
c)						
Section-2						
3.a)						
b)						
c)						
4.a)						
b)						
c)						
Section-3						
5.a)						
b)						
c)						
6.a)						
b)						
c)						

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Course Code	20PM01T	Semester	II
Course Title	Project Management Skills	Course Group	PM
No. of Credits	4	Type of Course	Activity based study
Course Category	Theory with Activities	Total Contact Hours	6 Hrs Per Week (2Theory +4 hrs of classroom activities)
			78 Hrs Per Semester
Prerequisites	10 th Level Mathematics	Teaching Scheme	4 hrs per week classroom sessions dedicated to case studies & activities
CIE Marks	50	SEE Marks	50

RATIONALE

Project Management is a confluence of Management principles and Engineering subject area. This course enables the students to develop conceptualisation of Engineering Management principles and apply the same for their engineering projects, in their domains, example, Software Development project or Construction Project and so on. The course integrates three core areas of Planning, Execution and Auditing of Projects.

1. COURSE SKILL SET

Student will be able to:

1. Understand what constitutes a project, Plan for the execution of the project by breaking into manageable work units, and Prepare necessary project artifacts
2. Track and control the Project while preparing verifiable records for Project Inspections and Audits
3. Inspect and Audit projects for Milestones or other project completion criteria and other metrics, Defects and remediation, Project learnings
4. Gain knowledge and develop curiosity on latest technology trends in Project management

2. COURSE OUT COMES

At the end of the course, student will be able to

C01	Apply the concepts of Project Management to real projects which are expressed in the form of the Project reports or Engineering drawings
C02	Estimate Project resources needed Time, Material and Effort, and Plan for execution
C03	Understand, analyse and assess the risks involved in a project and plan for managing them
C04	Use Project Management Software and processes to track and control Projects
C05	Conduct inspection of Projects and audit progress and bills
C06	Understand the Digital Technology trends in Project management and concepts like Smart cities

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

UNIT NO	UNIT TITLE	TEACHING HOURS (L-T-P)	MARKS DISTRIBUTION(THEORY)			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
1	Introduction	02-00-04	8	8	4	20
2	Project Administration	06-00-12	8	12	20	40
3	Project Lifecycle	04-00-08	8	12	20	40
4	Project Planning, Scheduling and Monitoring	06-00-12	8	12	20	40
5	Project Control, Review and Audit	06-00-12	8	12	20	40
6	Digital Project Management	02-00-04	8	8	4	20
	Total	26-00-52=78	48	64	88	200

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

4. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics / Subtopics	Hours L-T-P
1 Introduction	Use Basic Science, Maths skills to understand Project management and project planning, execution and control.	Introduction and definition, Features of a Project, Types of Projects, Benefits and Obstacles in Project Management, Project Management Profession, Role of Project manager, Consultants, Project and Operation, Project Management Process, Project Scope	02-00-04
2 Project Administration	Able to develop WBS, PEP and PM processes for Project with given inputs	Project Administration, Project Team, Project Design, Work Breakdown Structure (WBS), Project Execution Plan (PEP), Systems and Procedure Plan, Project Direction, Communication and Co-ordination, Project Success Case Study I	06-00-12
3 Project Lifecycle	Use project administration and project lifecycle knowledge to Assess and plan for project risk	Project Life Cycle, Phases - Project Planning, Project Execution, Project Closure, Project Risks, Project Cost Risk Analysis, Time and Cost overruns Case Study 2a	04-00-08
4. Project Planning, Project Scheduling and Project Monitoring and Implementation	Able to develop a detailed project plan given the inputs on manpower, funds availability and time availability	Project Planning Function, Structure, Project Scheduling, Project monitoring and Project evaluation Case Study 2b	06-00-12
5. Project Control, Review and Audit	Use Project Management lifecycle knowledge to Control project parameters, review and audit project performance	Project Control, Problems of Project Control, Gantt Charts, Milestone Charts, Critical Path Method (CPM), Network Technique in Project Scheduling, Crashing Project Duration through Network, Project Review, Initial Review, Performance Evaluation,	06-00-12

		Abandonment Analysis, Project Audit Case Study 2c	
6.Digital Project Management	Understand latest trends of digital technologies impacting the domain of project management and application of the same in multiple scenario	Digital Technology trends in Project management, Cloud Technology, IoT, Smart cities, Data and analytics, case studies Case study 3	02-00-04

1. MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	UNIT Linked	CL R/U/A	Sessions in Hrs	TOTAL - Marks
CO1	Understand the concepts of Project Management in relation to real projects which are expressed in the form of the Project reports or Engineering drawings Case Study - I	1, 2, 5, 7	1, 2	R/U/A	06	10
CO2	Estimate Project resources needed Time, Material and Effort, and Plan for execution Case study 2a	1, 2, 3, 7	2, 3	R/U/A	18	20
CO3	Evaluate the risks involved in a project and Plan for managing them Case Study - 2a	1,2,3,7	2,3	R/U/A	12	20

C04	Use Project Management methods with Software and/or processes to track and control Projects Case Study 2b	1, 4, 6, 7	4	R/U/A	18	20
C05	Conduct inspection of Projects and audit progress and bills Case Study 2c	1, 2, 5, 7	5	R/U/A	18	20
C06	Understand the Digital Technology trends in Project management, and Engineering Industries Case Study 3	1, 5, 7	6	R/U/A	06	10
					78	100

	CO's	Programme Outcomes s) (PO						
		1	2	3	4	5	6	7
Project Management	CO1	3	3	0	0	2	0	1
	CO2	3	3	3	0	0	0	1
	CO3	3	0	0	3	0	3	1
	CO4	3	0	0	3	0	3	1
	CO5	3	2	0	0	2	0	1
	CO6	3	0	0	0	2	0	2
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0-Not Mapped								

7. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.

2. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes.
3. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Topics be introduced always with a reallife example and then answering What, how, why and when.
5. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
6. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

8. SUGGESTED LEARNING RESOURCES:

SlNo.	Author	Title of Books	Publication/Year
1	Dr. Lalitha Balakrishnan & Dr. Gowri Ramachandran	Project Management	Himalaya Publishing, 2019
2	Shailesh Kumar Shivakumar	Complete Guide to Digital Project Management	Apress, 2019
3	Prasanna Chandra	Project planning, analysis, selection, implementation and review	Tata McGraw Hill
4	Gopala Krishnan	Project Management	Mcmillan India Ltd.

9. COURSE ASSESSMENT AND EVALUATION CHART

Sl.No	Assessment	Duration	Max marks	Conversion
1	CIE Assessment 1 (Written Test -1) At the end of 3 rd week	80 minutes	30	Average of three written tests 30
2	CIE Assessment 2 (Written Test -2) At the end of 7 th week	80 minutes	30	

Sl.No	Assessment	Duration	Max marks	Conversion
3	CIE Assessment 3 (Written Test -3) At the end of 13 th week	80 minutes	30	
4	CIE Assessment 4 (Group Assignment -1) At the end of 5 th week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Group Assignment -2) At the end of 9 th week	60 minutes	20	
6	CIE Assessment 6 (Individual Student activity/Assignment) At the end of 11 th week	60 minutes	20	
Total Continuous Internal Evaluation (CIE) Assessment				50
8	Semester End Examination (SEE) Assessment (Written Test)	3 Hrs	100	50
Total Marks				100

Note:

- SEE (Semester End Examination) is conducted for 100 Marks theory course for a time duration of 3 Hrs
- Three CIE (written test), each of 30 marks for a time duration of 80 minutes shall be conducted. Also, three CIE (MCQ or Quiz/Group Assignment/Individual student activity or assignment) each of 20 marks for the time duration of 60 minutes shall be conducted. Any fraction at any stage during evaluation will be rounded off to the next higher digit
- Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10 DETAILED COURSE CONTENT

Unit No And Name	DETAILED COURSE CONTENT	CONTACT HRS	TOTAL
	1.1 Introduction	3	

Unit No And Name	DETAILED COURSE CONTENT	CONTACT HRS	TOTAL
1. Introduction	1.2 Meaning of Project		6
	1.3 Definition and No Change Mode		
	1.4 Features of a Project		
	1.5 Types of Projects		
	1.6 Benefits of Project Management		
	1.7 Obstacles in Project Management		
	1.8 Project Management A Profession		
	1.9 Project Manager and His Role		
	1.10 Project Consultants		
	1.11 What is Operation?	3	
	1.12 Difference between Project and Operation		
	1.13 What is Process in Project Management and Process Groups?		
	1.14 What is Scope? Difference between Project Group Objectives and		
	1.15 Project Scope		
	2. Project Administra tion		
2.2 Project Team		6	
2.3 Project Design			
2.4 Work Breakdown Structure (WBS)			
2.5 Project Execution Plan (PEP)			3
2.6 Contracting Plan			
2.7 Work Packing Plan			
2.8 Organisation Plan		3	
2.9 Systems and Procedure Plan			
2.10 Project Procedure Manual			
2.11 Project Diary		3	
2.12 Project Execution System			
2.13 Project Direction			
2.14 Communication in a Project		3	
2.15 Project Co-ordination			

	2.16 Pre-requisites for Successful Project Implementation		
3. Project Lifecycle	3.1 Introduction	6	12
	3.2 Phases of Project Life Cycle		
	3.3 Project Management Life Cycle General		
	3.4 Project Planning		
	3.5 Project Execution		
	3.6 Project Closure		
	3.7 Project Risks	3	
	3.8 Types of Risks: Illustrations		
	3.9 Risk Assessment Techniques with Illustrations		
	3.10 Project Cost Risk Analysis	3	
	3.11 Estimating Time and Cost Overrun Risks		
	3.12 Organisation/Procedural/Systemic Reasons for Project Cost Overruns		
	3.13 Time Overruns		
4. Project Planning, Scheduling and Monitoring	4.1 Introduction	6	18
	4.2 Nature of Project Planning		
	4.3 Need for Project Planning		
	4.4 Functions of Project Planning		
	4.5 Steps in Project Planning		
	4.6 Project Planning Structure		
	4.7 Project Objectives and Policies		
	4.8 Tools of Project Planning		
	4.9 Project Scheduling	6	
	4.10 Time Monitoring Efforts		
	4.11 Bounding Schedules		
	4.12 Scheduling to Match Availability of Manpower		
	4.13 Scheduling to Match Release of Funds		
	4.14 Problems in Scheduling Real-life Projects		
	4.15 Introduction	3	

	4.16 Situation Analysis and Problem Definition		3	
	4.17 Setting Goals and Objectives			
	4.18 Generating Structures and Strategies			
	4.19 Implementation			
	4.20 What is Project Evaluation?			
	4.21 Why is Project Evaluation Important?			
	4.22 What are the Challenges in Monitoring and Evaluation?			
5. Project Control, Review and Audit	5.1 Introduction	6	18	
	5.2 Projected Control Purposes			
	5.3 Problems of Project Control			
	5.4 Gantt Charts			
	5.5 Milestone Charts			
	5.6 Critical Path Method (CPM)	6		
	5.7 Construction of a Network			
	5.8 Network Technique in Project Scheduling			
	5.9 Crashing Project Duration through Network			
	5.10 Project Review	3		
	5.11 Initial Review			
	5.12 Post Audit			
	5.13 Performance Evaluation			
	5.14 Abandonment Analysis	3		
	5.15 Objectives of Project Audit			
	5.16 Functions of Project Auditor			
	5.17 Project Audit Programme			
	5.18 Difficulties in Establishing Audit Purpose and Scope			
6. Digital Project Management	6.1 Digital Technology trends in Project management	1	6	
	6.2 Cloud Technology, IoT, AR and VR applications in Project management, Smart Cities	1		

6.3 Data Science and Analytics in Project Management	1
6.4 Case Studies	3

Case Studies:

Please note: The Tutors can either use the following Case studies and activities or Design on their own, with the overall Learning Outcomes being met.

Case Study I: Residential House – Project Execution Plan

1. Dr. Sunil Kulkarni wants to build a house on his 9000 square feet (90x100) vacant plot in Bengaluru. His requirements were given below.
 - i) He lives with his wife, parents and two college going children.
 - ii) He likes open space around his house and likes to do gardening during free time
 - iii) His wife teaches Yoga and about 30 middle aged and old people attend the daily sessions.
 - iv) He has a budget limitation of INR 230,00,000 for this project and wants to present to his wife on their 20th wedding anniversary which is 18 months away.
 - v) His parents can not climb stairs and hence prefer a ground floor room
 - vi) All the rooms should have attached bathrooms

How-ever the Civil contractor who took the work, overshoot the time and money available and hence Dr Sunil was unhappy with the Architect firm who recommended the Contractor.

Task:

- Split the class into groups of three
- Ask them to prepare 2D drawings with Plan, Elevation, Sections and perspectives.
- Prepare the detailed WBS, a Project execution plan and Project communication plan for contractors
- Estimate the quantities
- Discuss on the possible reasons for delay and methods with which performance to both time and budget could have been achieved
- Present it in a seminar, with each group getting 5-10 minutes to present their idea.

Case Study 2a:

The Columbus Hospital proposed in Hubli is a 200 bed speciality private hospital for treatment of Cancer. The hospital will come up on a 12 acre plot between Hubli-Dharwad. A leading construction company has come forward to complete the hospital works from concept to commissioning in 9 months. The promoters are willing to spend a premium to complete the hospital in 9 month time and are not particular about type of construction, ie, RCC, Steel frame etc. The key requirements are as follows:

- i) 200 bed hospital of which 40 are for critical care (ICU), 40 for pre and post Operative care
- ii) 4 Operation Theatres - 2 Major (Minimum 800 SFT each) and 2 minor (minimum 400 sft each)
- iii) One full fledged Diagnostic laboratory (1500 Sft)
- iv) One 24x7 pharmacy (360 Sft min)
- v) Doctors rooms, Nurses enclosures, Change rooms
- vi) Office with billing counters (min 2000 sft) for all administrative staff
- vii) Wheel chair parking bays, Stretcher parking bays in all floors
- viii) One Cafeteria with 50 person capacity
- ix) One conference room with Multimedia equipment (300 sft min)
- x) Parking for ambulances, 4 wheelers, two wheelers
- xi) Reception and enquiry counter
- xii) All amenities should be accessible for disabled persons
- xiii) Incinerator, Waste storage and disposal area
- xiv) Generator and fuel storage area

Discuss

- i) The various alternative approaches available to complete the hospital.
- ii) Look into National Building Code and BIS standards for arriving at approximate (+/- 10%) super built-up area required, amenities to be planned
- iii) The various phases of the project according to Project lifecycle and durations
- iv) Prepare the detailed WBS, Project Organisation required and Project Dairy template
- v) Prepare a Project Plan with risks involved and the risk management plan.
- vi) Estimate the cost of time overrun if the project is delayed by 114 calendar days due to issues with approvals

Case Study 2b:

For case study 2 above, prepare an Implementation Plan using a spreadsheet software.

Discuss

- i) What happens if a pandemic affects the project in its 7th Month. How do you mitigate the possible issues in implementation?
- ii) What happens if during the fourth month of projects the client decides to reduce funds for the month by 50% ?

Case Study 2c:

For case study 2 above, prepare a Critical Path method Chart (CPM) showing all main activities in the WBS with milestones.

Discuss

- i) What happens if the client decides to complete the ground floor roof 15 days earlier ?
- ii) What happens if the client reduces the inflow of project funds by 50% for the month 4 ?
- iii) Write an Audit report for the project at the end of 6th month

Case Study 3:

This will be done as a student activity and has two components.

- i) Research on 3D printing in any industry and prepare a three page article
- ii) Study usage of Drones in different Industries and evaluate the Cost benefits of using the same for any one scenario.

Model Question Paper

I A Test (CIE)

Programme:		Semester: I			
Course:		Max Marks: 30			
Course Code:		Duration: 1 Hr 20 minutes			
Name of the course coordinator:		Test: I/II/III			
Note: Answer one full question from each section. One full question carries 10 marks.					
Qn.No	Question	CL	CO	PO	Marks
Section-1					
1.a)					
b)					
c)					
2.a)					
b)					
c)					
Section-2					
3.a)					
b)					
c)					
4.a)					
b)					
c)					
Section-3					
5.a)					
b)					
c)					
6.a)					
b)					
c)					

Model Question Paper Semester End Examination

Programme:	Semester: I
Course:	Max Marks: 100
Course Code:	Duration: 3 Hrs

Instruction to the Candidate: Answer one full question from each section. One full question carries 20 marks.				
Qn.No	Question	CL	CO	Marks
Section-1				
1.a)				
b)				
2.a)				
b)				
Section-2				
3.a)				
b)				
4.a)				
b)				
Section- 3				
5.a)				
b)				
6.a)				
b)				
Section-4				
7.a)				
b)				
8.a)				
b)				
Section-5				
9.a)				
b)				
10.a)				
b)				

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Course Code	20SC02P	Semester	I/II
Course Title	STATISTICS AND ANALYTICS	Course Group	Core
No. of Credits	4	Type of Course	Lecture and practice
Course Category	Practice	Total Contact Hours	6 Hrs Per Week
			78 Hrs Per Semester
Prerequisites	10 TH LEVEL MATHEMATICS	Teaching Scheme	(L: T:P)-1:0:2
CIE Marks	60	SEE Marks	40

RATIONALE

Statistics and analytics help the learner to use the proper methods to collect the data, employ the correct analyses, effectively present the results and conduct research, to be able to read and evaluate journal articles, to further develop critical thinking and analytic skills, to act as an informed consumer and to know when you need to hire outside statistical help. The python language is one of the most accessible programming languages available because it has simplified syntax and not complicated, which gives more emphasis on natural language.

COURSE OUT COMES

At the end of the course, student will be able to

C01	Understand the tools of data collection, classification and cleaning of data.
C02	Able to summarize the given statistical data
C03	Understand the measure of location and dispersion of data.
C04	Learn the basics of Python programming.

DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill Sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 STATISTICAL DATA COLLECTION AND TYPES	<ul style="list-style-type: none"> ➤ Able to collect statistical data. ➤ Able to distinguish the data types. ➤ Understands the usage of data collection tools ➤ Able to specify problem statement for data collection ➤ Able to collect data pointing the root cause of the problem statement. 	a Definition of data and classification (qualitative quantitative discrete and continuous data). b Data collection tools iv) Questionnaires. v) Survey. vi) Interviews. vii) Focus group discussion. 1.3 Data cleaning.	4-0-8
UNIT-2 SUMMARIZATION OF DATA	<ul style="list-style-type: none"> ➤ Sketches bar, pie and histograms on Microsoft Excel spread sheet. ➤ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. ➤ Sketches bar, pie and histograms on Microsoft Excel spread sheet. ➤ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. 	a Descriptive statistics viii) Datatabulation(frequency table ix) Relative frequency table. b Grouped data x) Bar graph xi) Pie chart xii) Line graph xiii) Frequency polygon xiv) Frequency curve xv) Relative frequency polygon xvi) Histograms xvii) Box plot xviii) Leaf-stem plot To be done in Microsoft excel.	8-0-16
UNIT-3 MEASURE OF LOCATION AND DISPERSION	<ul style="list-style-type: none"> ➤ Able to determine the descriptive statistical variables using Microsoft Excel. 	a Determination of central tendencies Range, Mean, Mode and Median for the data in Microsoft excel. b Determination of absolute	6-0-12

	<ul style="list-style-type: none"> ➤ Able to determine the absolute measures of dispersion of the given data set. ➤ Explain the symmetry and asymmetry of the distributed data. 	<p>measures of dispersion for data like range quartile deviation, mean deviation, standard deviation and variance in Microsoft Excel.</p> <p>c Skewness and kurtosis graphs in Microsoft excel and interpretations of results.</p>	
<p>UNIT-4 INTRODUCTION TO PYTHON PROGRAMMING</p>	<ul style="list-style-type: none"> ➤ Able Install and run the Python interpreter. Create and execute Python programs. ➤ Understand the concepts of file I/O. ➤ Able to read data from a text file using Python. ➤ Learn variable declarations in Python. ➤ Learn control structures. ➤ Learn loop constructs. 	<p>4.1 Introduction to PYTHON.</p> <p>4.2 Syntax of PYTHON.</p> <p>4.3 Comments of PYTHON.</p> <p>4.4 Data types of PYTHON.</p> <p>4.5 Variables of PYTHON.</p> <p>4.6 If-else in PYTHON.</p> <p>4.6 Loops in PYTHON.</p> <p>4.7 Arrays and functions in PYTHON.</p>	<p>8-0-16</p>

SL NO	Practical outcomes/Practical exercises	Unit no	PO	CO	L:T:P
1	Prepare a questionnaire (closed end) containing 25 questions for a specified problem statement: for example experience of an individual in a restaurant.	1	1,2,4,5,7	1	0:0:2
2	Prepare a Google form for a specified problem statement to collect the dataset. (for example questionnaire to conduct online quiz)	1	1,2,4,5,7	1	0:0:2
3	Send out a survey on your problem statement to number of 50 (By Google forms) and collect the data.	1	1,2,4,5,7	1	0:0:2
4	Remove duplicate or irrelevant observations. Remove unwanted observations from the dataset provided, including duplicate observations or irrelevant observations.	1	1,2,4,5,7	1	0:0:2
5	In Microsoft Excel spread sheet draw the frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
6	In Microsoft Excel spread sheet draw the relative frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
7	Using Microsoft Excel spread sheet plot bar graph for the data collected from 100 people(for example, conduct a survey on the favorite fruit of a person in your locality(restricting to 5 to 6 fruits). Explain the bar graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
8	Using Microsoft Excel spread sheet plot pie chart for the data collected from 50 people(for example, conduct a survey on the smokers with respect to their ages in your locality. Explain the pie chart with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
9	Using Microsoft Excel spread sheet draw a line graph for the given dataset.	2	1,2,4,5,7	2	0:0:2
10	Using Microsoft Excel spread sheet draw frequency polygon and frequency curve for the data collected from 50 people. (For example, marks obtained by the students in your class in 5 subjects in previous examination). Explain your observations from the graph in minimum 30 words.	2	1,2,4,5,7	2	0:0:2
11	Using Microsoft Excel spread sheet construct a box plot for the given dataset. (For example dataset can be the number of passengers in a flat form at different time in a day).	2	1,2,4,5,7	2	0:0:2
12	Using Microsoft Excel spread sheet construct a leaf plot for the given dataset. Explain the graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2

13	Using Microsoft Excel spread sheet find the Mean, Mode and Median for the data (univariate data) given and also represent them in a Histogram.	3	1,2,4,5,7	2	0:0:2
14	Generate a 50 random data sample (even and odd number dataset) using Microsoft Excel spread sheet and determine the range and Quartiles.	3	1,2,4,5,7	2	0:0:2
15	Collect the current yield of a crop from 50 different persons (problem statement can be changed according to priorities of the tutor) in your locality and determine mean deviation and Quartile deviation in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
16	Collect the data of any 2 livestock population from 50 different houses in your locality (problem statement can be changed according to priorities of the tutor) and determine standard deviation for both the two separately in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
17	Collect the data of two wheeler (with a rider and a pillion) crossing a busy junction in your locality in the peak hours (problem statement can be changed according to priorities of the tutor) and determine the variance of the data in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
18	Using Microsoft Excel spread sheet draw a Skewness graph and kurtosis graph for randomly generated dataset.	3	1,2,4,5,7	3	0:0:2
20	Write a python program to add 2 integers and 2 strings and print the result.	4	1,2,4,5,7	4	0:0:2
21	Write a python program to find the sum of first 10 natural numbers.	4	1,2,4,5,7	4	0:0:2
22	Write a python program to find whether the number is odd or even.	4	1,2,4,5,7	4	0:0:2
23	Write a python program to find the variance and standard deviation for the given data..	4	1,2,4,5,7	4	0:0:2
24	Write a python program to display student marks from the record.	4	1,2,4,5,7	4	0:0:2
25	Write a python program to create a labeled bar graph using matplotlib. pyplot.	4	1,2,4,5,7	4	0:0:2
26	Write a python program to create a labeled pie chart using matplotlib. pyplot.	4	1,2,4,5,7	4	0:0:2
Total Hours					0:0:52=5 2

MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	Experiment Linked	Cognitive Level R/U/A	Tutorial & Practical Sessions in Hrs.	TOTAL
C01	Understand the tools of data collection, classification and cleaning of data.	1,2,4,5,7	1-4	A	12	12
C02	Able to summarize the given statistical data	1,2,4,5,7	5-12	A	33	33
C03	Understand the measure of location and dispersion of data.	1,2,4,5,7	13-18	A	12	12
C04	Learn the basics of Python programming.	1,2,4,5,7	19-26	A	21	21
					78	78

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Statistics & Analytics	C01	3	3	0	3	3	0	3
	C02	3	3	0	3	3	0	3
	C03	3	3	0	3	3	0	3
	C04	3	3	0	3	3	0	3
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

SUGGESTED LEARNING RESOURCES:

1. Statistical Analysis with Excel For Dummies (For Dummies Series) Paperback Import, 9 April 2013 by [Joseph Schmuller](#) (Author)
2. <https://www.brianheinold.net/python/A Practical Introduction to Python ProgrammingHeinold.pdf>
3. http://www.bikeprof.com/uploads/9/0/6/5/9065192/excel_stats_handout_npl.pdf
4. <https://adminfinance.umw.edu/tess/files/2013/06/Excel-Manual1.pdf>
5. <https://www.brianheinold.net/python/A Practical Introduction to Python ProgrammingHeinold.pdf>
6. Introduction to Python programming for beginners by Vivian Baily Kindle edition.
7. PYTHON PROGRAMMING: Python programming: the ultimate guide from a beginner to expert by Clive Campbell.
8. Open source for python: <https://hub.gke2.mybinder.org/user/jupyterlab-jupyterlab-demo-zfkdw4y/lab>

SUGGESTED LIST OF STUDENT ACTIVITY

Note: The following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)

1	<p>Describe the data collection activity itself (interviews, surveys, library research, etc.) AND why this specific form of data collection was chosen. Be sure to explain why you think this kind of data will help you in your design process. Also be sure to provide details about the activity: how many interviews, how long they took, where they took place, how many questions asked in a survey, how many respondents, etc.</p> <p>Present the results of your data collection. You do not have to have completely analyzed all your data, but do make sure you present the results of your research. If you did a survey, please attach a copy of the survey as an appendix; if you did interviews, please attach a copy of the interview questions.</p> <p>Discuss any preliminary analysis of your data. What have you learned thus far from the data should be discussed from an analytical perspective (rather than a data dump). For example, if you surveyed people about their use of the local bus system, and 90% of your respondents said they take the bus when it is raining, and 60% of your respondents said they usually wait more than 10 minutes for a bus, think about what this teaches you rather than just the information itself. In this instance, you can see that people are generally waiting for several minutes in the rain for a bus, so a covered bus stop might be a good idea. Keep in mind that your findings from data should lead directly to the conclusions you make about your design recommendations. This is the time to begin thinking very specifically about your research in those terms. This is also an opportunity to think about your definition of “better” and how it applies to your design goals and your choice of research activities (for example, if you are choosing to make something better by making it cheaper, maybe you are interviewing people to see how much loss of functionality or decrease in features for a technology they are willing to tolerate).</p>
2	<p>https://ils.unc.edu/courses/2013_spring/inls541_001/Assignments.html#Assignment_9</p>

	DOWNLOAD a dataset from the above link and use data visualization tools to analyze it.
3	Acquire the dataset from https://www.kaggle.com/datasets (For example acquire the data of IPL ball by ball scores and find the standard deviation and variance of score of a batsmen) and clean the data for the root cause of the problem statement and summarize the data and explain the inference.

COURSE ASSESSMENT AND EVALUATION CHART

Meth od	What		To whom	When/Wh ere (Frequenc y in the course)	Max Mar ks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuo us Internal Evaluation)	Mode ls	Studen ts	Two IA Tests (Written)	20	Blue Book	1,2,3.
				Three Skill tests	20	Model	1,2,3
				Student Activity	20	Model/Rep ort	
				TOTAL	60		
	SEE (Semester End Examinati on)	End Exam		End of the course	100	Models	1,2,3
INDIRECT ASSESSMENT	Student Feedback on course		Studen ts	Middle of the course		Feedback forms	1,2,3, Delivery of course
	End of Course Survey			End of the course		Questionnai res	1,2,3 Effectiveness of Demonstratio ns& Assessment Methods

Sl.No	Assessment	Duration	Max marks	Conversion
1	CIE Assessment 1 (Written Test -1-theory) - At the end of 3rd week	60 minutes	20	Average of two written tests 20
2	CIE Assessment 2 (Written Test -2-theory) - At the end of 13th week	60 minutes	20	
3	CIE Assessment 3 (Skill test) - At the end of 5th week	3 Hrs	20	Average of three skill tests 20
4	CIE Assessment 4 (Skill test) - At the end of 7th week	3 Hrs	20	
5	CIE Assessment 5 (Skill test) - At the end of 9th week	3Hrs	20	
6	CIE Assessment 6 (Student activity) - At the end of 11th week	-	20	20
7	Total Continuous Internal Evaluation (CIE) Assessment			60
8	Semester End Examination (SEE) Assessment (Practical Test)	3Hrs	100	40
Total Marks				100

Note:

1. CIE written test is conducted for 20 marks (Two sections). Each section shall have two full questions of same CL, CO. Student shall answer one full question (10 marks) from each section.
2. CIE Skill test is conducted for 100 marks (3 Hours duration) as per scheme of evaluation and the obtained marks are scaled down to 20 marks.
3. SEE is conducted for 100 Marks (3 Hours duration) as per scheme of evaluation.

MODEL QUESTION PAPER**CIE, SKILL TEST AND SEMESTER END EXAMINATION**

Course & Programme: Common to all Engineering Programmes.	Semester: II
Subject: Statistics and Analytics Practice	Max Marks: 100
Course Code : 20SC21P	Duration : 3Hrs

Instruction to the Candidate: Answer both questions

Qn.No	Question	CL	CO	PO	Marks
1	For the given ungrouped data set plot the bar graph by grouping the data in Microsoft excel spread sheet and interpret the obtained results. (Dataset, bar graphs and interpretation have to be entered in the answer script). OR Generate a random data set in Microsoft excel spread sheet containing 50 data and find the mean mode and median in Microsoft excel spread sheet and interpret the obtained results. (Dataset, bar graphs and interpretation have to be entered in the answer script).	A	2,3	1,2,4,5,7	50
2	Write the python program to enter two integers and two strings and to print the sum two integers and two strings.	A	4	1,2,4,5,7	50

Questions are not framed from Unit 1 in the final SEE. Short questions can only be asked from that unit.

SCHEME OF EVALUATION FOR BOTH CIE AND SEE

Sl. No	Particulars	Marks
1	Short questions from Unit 1	10
2	Observation	30

3	Conduction	20
4	Output and Interpretation of result	20
5	Viva-voce	20
Total		100

EQUIPMENT LIST

FOR STATISTICS AND DATA ANALYTICS LAB

2 laboratories. Each containing 30 computers (Desktop) with the following system requirements.

SYSTEM REQUIREMENTS			
SL NO	REQUIREMENTS	MINIMUM	RECOMMENDED
1	RAM	4GB FOR FREE RAM	8GB OF TOTAL SYSTEM RAM
2	DISK SPACE	2.5 GB AND 1 GB FOR CACHES	SSD DRIVE WITH AT LEAST 5 GB OF FREE SPACE
3	MONITOR RESOLUTION	1024x768	1920×1080
4	OS(OPERATING SYSTEM)	OFFICIALLY RELEASED 64-BIT VERSIONS OF THE FOLLOWING: MICROSOFT WINDOWS 8 OR LATER	LATEST 64-BIT VERSION OF WINDOWS

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20EE01P	Semester	I/II
Course Title	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING	Course Group	Core
No. of Credits	4	Type of Course	Lecture & Practice
Course Category	PC	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Basic Science	Teaching Scheme	(L:T:P)= 1:0:2
CIE Marks	60	SEE Marks	40

1. RATIONALE

Fundamentals of Electrical and Electronics Engineering is essential for all streams of diploma engineering to work in any industry as it covers basic electrical safety, troubleshooting and repairing of simple electrical systems. Basic knowledge of electrical wiring circuits, protective devices, electrical machines and basic electronics devices is required to work in any engineering field.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences

1. Perform and test domestic wiring
2. Can operate electrical machine
3. Test different electronics devices

3. INSTRUCTIONAL STRATEGY

1. Expose to different learning tools used in respective labs, Operational safety and Procedure to be followed in the laboratory.
2. Instructor should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to understand and grasp these concepts and principles. In all contents, SI units should be followed.
3. Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be skill and employability based.

4. COURSE OUT COMES

On successful completion of the course, the students will be able to

C01	Comply with the safety procedures
C02	Apply the fundamentals of electricity.
C03	Install and test electrical wiring system.
C04	Identify and Operate electrical machines, Batteries and UPS.

CO5	Identify and test the different electronic devices.
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5. COURSE TOPICS:

Unit No	Unit Name	Hours
1	Electrical Safety	6
2	Electrical Fundamentals	15
3	Protective Devices and Wiring circuits	15
4	Electric Machines and Batteries and UPS	15
5	Introduction to Electronic Devices and Digital Electronics	27
	Total	78Hr

6. COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

Sl No	Unit skill set (In cognitive domain) <i>On successful completion of the class, the students will be able to</i>	Topics/Sub topics	Practical	Hours L-T-P
UNIT-1 Electrical Safety				
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety <ul style="list-style-type: none"> Identify Various types of safety signs and what they mean Demonstrate and practice use of PPE Demonstrate how to free a person from electrocution Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. Fire safety, causes and precautionary activities. Use of appropriate fire extinguishers on different types of fires. Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency Inform relevant authority about any abnormal situation Earthing: Types 	1. Electrical symbols related to electrical engineering. 2. Electrical safety 3. Electrical earthing	02-00-04

		<ul style="list-style-type: none"> ➤ http://nreeder.com/Flash/symbols.htm ➤ http://bouteloup.pierre.free.fr/iufm/as/de/house/safety.html 		
UNIT-2 Electrical Fundamentals				
2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. Identification Measuring devices <ul style="list-style-type: none"> • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 4. Explain supply systems like AC, DC. ➤ http://nreeder.com/Flash/units.htm	1. Connect voltmeter and ammeter in a simple circuit. (Practicing of identification and connection of different meters)	1:0:2
3	Calculate basic electrical quantities	<ul style="list-style-type: none"> • Relationship between V, I and R. (Ohms law) • Behavior of V, I in Series and Parallel DC circuits. • Describe open circuit, close circuit and short circuit • http://nreeder.com/Flash/ohmsLaw.htm 	1. Measure current, voltage and analyze effective resistance in series circuit 2. Demonstrate effects of shorts and opens in a circuit	1:0:2
4	Connect resistances in different combination	1. Equation to find the effective Resistances connected in series 2. Equation to find effective Resistances connected in parallel 3. Resistances connected series and parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of parallel connected resistances.	1:0:2
5	Calculate and measurement of different parameters of an AC quantity.	Ac sinewave: Sinusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. ➤ http://nreeder.com/Flash/freqPeriod.htm ➤ http://nreeder.com/Flash/oscill.htm	Generate and demonstrate the measurement of frequency, time period and phase difference of	1:0:2

		oscope.htm	AC quantity using CRO and function generator.	
6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, power and power factor <ul style="list-style-type: none"> • SI units • Mention the meters used to measure them ➤ http://nreeder.com/Flash/powerLaw.htm	• Measure the voltage, current, power using relevant measuring instruments in a Single-phase load.	1:0:2
7.		1. Electrical energy <ul style="list-style-type: none"> • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply.	1. Measure single phase energy using relevant measuring instruments in a Single-phase load. 2. Measure the voltages in Three phase supply.	
UNIT-3				
Protective Devices and Wiring circuits				
8.	1. Identify and select Protective Devices for given current and voltage rating 2. Identify and select the various electrician tools	<ul style="list-style-type: none"> • Necessity of Protective Devices • Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB • RCCB • ELCB • Relay • Different types of electrician tools and their function. • Describe various wiring tools. • State procedure of care and maintenance of wiring tools. 	1. Wire up and test PVC Conduit wiring to control one lamp from two different places using suitable protective devices.	1:0:2

9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. <ul style="list-style-type: none"> • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cables used for different current and voltage ratings.	1. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps.	2:0:4
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1 ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	1:0:2
UNIT-4 Electrical Machines and Batteries and UPS				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	Transformer <ul style="list-style-type: none"> • working principle • Transformation ratio • Types and applications with their ratings 	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	1:0:2
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Star-delta starter and induction motor	1. Induction motor <ul style="list-style-type: none"> • Single phase and three phase Induction motor. • Necessity of starters. • Describe DOL AND STAR-DELTA starters. 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Star-delta starter. 2. Troubleshoot the DOL/ Star-delta starter and induction motor	2:0:4

13	Select and test the battery for a given application	Battery <ul style="list-style-type: none"> Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). Selection criteria of batteries for different applications. Ampere-Hour Capacity. Efficiency 	Testing Condition of charging and discharging of a Lead-acid battery	1:0:2
14	Select the size of the UPS for a given application	UPS <ul style="list-style-type: none"> List the types and applications Selection criteria of UPS Sizing of UPS 	Sizing of UPS	1:0:2
UNIT-5 Introduction to Electronic Devices and Digital Electronics				
15	Identify and differentiate Conductors, insulators and semiconductors.	1. Compare Conductors, insulators and semiconductors with examples. 2. Identification of types and values of resistors-color codes. ➤ http://nreeder.com/Flash/resistor.htm	Determine the value of resistance by color code and compare it with multimeter readings.	1:0:2
16	Identify and test PN junction Diode	PN junction diode <ul style="list-style-type: none"> Symbol Characteristics Diode as switch. Types of diodes and ratings Applications 	Identify the terminals of a Diode and test the diode for its condition.	1:0:2
17	Build and test bridge rectifier circuit	Rectifier <ul style="list-style-type: none"> Need for AC to DC conversion Bridge rectifier with and without C filter, Rectifier IC. 	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	1:0:2
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	Transistor (BJT) <ul style="list-style-type: none"> Symbol Structure Working principle 	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	1:0:2
19.	1. Identify and test different digital IC	<ul style="list-style-type: none"> Comparison of analog and digital signal Digital systems, examples. Binary numbers, Boolean identities and laws. Digital system building blocks: Basic logic gates, symbols and truth tables. IC-Definition and advantages.	<ul style="list-style-type: none"> Test a Digital IC. Identification and selection of suitable ICs for basic gates. 1. Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	2:0:4

20	Identify and test various Sensors and actuators.	1.Sensors <ul style="list-style-type: none"> • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/ specifications, cost, and applications) 2.Actuators <ul style="list-style-type: none"> • Concept • Types and applications. • Relay as an actuator. 	2. Connect and test an IR proximity sensor to a Digital circuit. <ul style="list-style-type: none"> • Connect and test a relay circuit using an Opto-coupler. (Photo Diode & Transistor) Refer note	2:0:4
21	Know the application of Microcontroller and PLC	<ul style="list-style-type: none"> • Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications. (Activity based learning) 	<ul style="list-style-type: none"> • Identify different application microcontroller. • Identify commercially available PLC and their specifications 	1:0:2
TOTAL				26-0-52=78 Hours

7. PRATICAL SKILL EXERCISES

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO	L: T:P Hrs.
1	<ul style="list-style-type: none"> • Identify Various types of safety signs and what they mean Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard. • Inform relevant authority about any abnormal situation during fire hazard. 	1	1,4	1	0:0:2
2	<ul style="list-style-type: none"> • Demonstrate different types of earthing/using videos. • Prepare a Report on types of Earthing 	1	1,4	1	0:0:2
3	Connect voltmeter and ammeter in a simple circuit. (Practicing of identification and connection of different meters)	2	1,4	2	0:0:2
4	1.Determine the equivalent Resistance of series connected resistances. 2.Demonstrate effects of shorts and opens in a circuit	2	1,4	2	0:0:2

5	Determine the equivalent Resistance of parallel connected resistances.	2	1,4	2	0:0:2
6	Generate and demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.	2	1,4	2	0:0:2
7	Measure the voltage, current, power using relevant measuring instruments in a Single-phase load.	2	1,4	2	0:0:2
8.	1.Measure single phase energy using relevant measuring instruments in a Single-phase load. 2. Measure the voltages in Three phase supply.				
9.	Wire up and test PVC Conduit wiring to control one lamp from two different places using suitable protective devices.	3	1,4	3	0:0:2
10	2. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps.	3	1,4	3	0:0:2
11	Wire up and test PVC Conduit wiring to control one lamp from two different places.	3	1,4	3	0:0:2
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 three pin sockets.	3	1,4	3	0:0:2
13	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	4	1,4	4	0:0:2
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/star-delta starter.	4	1,4	4	0:0:2
15	Troubleshoot the DOL/Star-delta starter and induction motor	4	1,4	4	0:0:2
16	Testing Condition of charging and discharging of a Lead-acid battery.	4	1,4	4	0:0:2
17	Estimate the UPS rating for a computer lab with 50 computers/domestic.	4	1,4	4	0:0:2
18	Determine the value of resistance by color code and compare it with multimeter readings	5	1,4	5	0:0:2
19	Identify the terminals of a Diode and test the diode for its condition.	5	1,4	5	0:0:2
20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	5	1,4	5	0:0:2
21	Identification of transistor terminals and test. Construct and test the transistor as an electronic switch.	5	1,4	5	0:0:2
22	Test an IC. Verify the truth-table AND, OR, NOT logic gates.				
23	Verify the truth-table NAND, NOR, EX-OR, EX-NOR logic gates.	5	1,4	5	0:0:2
24	Connect and test anIR proximity sensor to a Digital circuit. NOTE: Any sensor listed in the theory may be used for condition appropriately.				

25	Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	5	1,4	5	0:0:2
26	1. Identify MCS-51 variants 2. Identify commercially available PLC and their specifications.	5	1,4	5	0:0:2
Total					0:0:52 =52Hrs

8.MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	Experiment	Cognitive Level R/U/A	Lecture & Practical Sessions in Hrs	TOTAL
C01	Comply with the safety procedures	PO1, PO4	1-2	A	6	
C02	Apply the fundamentals of electricity.	PO1, PO4	3-7	A	15	
C03	Install and test electrical wiring system and protective devices.	PO1, PO4	8-12	A	15	
C04	Identify and Operate electrical machines, Batteries and UPS.	PO1, PO4	13-17	A	15	
C05	Identify and test the different electronic devices.	PO1, PO4	18-26	A	27	

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Fundamentals of Electrical and Electronics Engineering	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0-Not Mapped								

9. SUGGESTED LEARNING RESOURCES:**Reference Books:**

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering by V. Mittle and Arvind Mittle, McGrawHill Companies, 2005 Edition.
5. The 8051 Microcontroller & Embedded systems by M. A. Mazidi, J. C. Mazidi & R. D. McKinlay ISBN: 81-317-1026-2 (2nd Edition)
6. Programmable Logic controllers, W BOLTON

e-Resources

1. https://www.youtube.com/watch?v=mc979OhitAg&list=PLWv9VM947MKi_7yI0_FCfzTBXpQU-Qd3K
2. <https://www.youtube.com/watch?v=CWulQ1ZSE3c>
3. en.wikipedia.org/wiki/Transformer
2. www.animations.physics.unsw.edu.au/~jw/AC.html
3. www.alpharubicon.com/altenergy/understandingAC.htm
4. www.electronics-tutorials
5. learn.sparkfun.com/tutorials/transistors
6. www.pitt.edu/~qi4/Academic/ME2082/Transistor%20Basics.pdf
7. www.technologystudent.com/elec1/transis1.htm
8. www.learningaboutelectronics.com
9. www.electrical4u.com
10. https://www.youtube.com/watch?v=zLW_7TPf310
11. <https://www.youtube.com/watch?v=8PTNjw-hQIM>

10. SUGGESTED LIST OF STUDENTS ACTIVITIES for CIE

Note: the following activities or similar activities for assessing CIE (IA) (Any one)

Each student should conduct different activity and no repeating should occur

1	Using suitable meters/ instruments give the practical working circuits to measure
2	Resistance, Current, Voltage, Power and Energy in DC and AC (Single phase) Circuits.
3	List out the different types of wiring systems used in your laboratories or house with their representation.
4	Mini-Projects: Like preparing extension box, switch box and wiring models,
5	List out the different protective devices used in your laboratories or house with their ratings.
6	Applications of Electro Magnetic Induction, statically induced and dynamically induced emf, self and mutual induced emfs.
7	Prepare a report on types of starters and enclosures used for various industrial applications of AC motors.
8	Types of Cells and Battery maintenance
9	Visit nearby Battery charging shop or show room and prepare a report of the visit.
10	Prepare a report on various types of diodes used for various industrial applications.
11	Prepare a report on various types of sensors and actuators used for various industrial applications.
12	Mini-Projects: Connect and test a sensor (domain application) to a Digital circuit

11. COURSE ASSESSMENT AND EVALUATION CHART

Sl.No	Assessment	Duration	Max marks	Conversion	
1.	CIE Assessment 1 (Written Test -1-theory) - At the end of 3rd week	60 minutes	20	Average of two written tests 20	
2.	CIE Assessment 2 (Written Test -2-theory) - At the end of 13th week	60 minutes	20		
3.	CIE Assessment 3 (Skill test) - At the end of 5th week	3 Hours	100	20	Average of three skill tests 20
4	CIE Assessment 4 (Skill test) - At the end of 7th week	3 Hours	100		
5	CIE Assessment 5 (Skill test) - At the end of 9th week	3 Hours	100		
6	CIE Assessment 6 (Student activity) - At the end of 11th week	-	20	20	
7.	Total Continuous Internal Evaluation (CIE) Assessment			60	
8.	Semester End Examination (SEE) Assessment (Practical Test)	3 Hours	100	40	
Total Marks				100	

Note:

1. CIE written test is conducted for 20 marks (Two sections). Each section shall have two full questions of same CL, CO. Student shall answer one full question (10 marks) from each section.
2. CIE Skill test is conducted for 100 marks (3 Hours duration) as per scheme of evaluation and the obtained marks are scaled down to 20 marks

12. SCHEME OF VALUATION FOR SKILL TEST (CIE) & SEE**(CONTINUOUS INTERNAL & SEMESTER END EXAMINATION)**

Sl. No.	Particulars	Marks
1.	Identification of meters/ equipment/wires/tools etc.	10
2.	Writing Circuit/writing diagram and Procedure*	25
3.	Conduction	35
4.	Results	10
5.	Viva-voce	20
Total		100

12. RUBRICS FOR ACTIVITY

RUBRICS FOR ACTIVITY (Example only) Faculty need to develop appropriate rubrics for respective activity						
Dimension	Beginning	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	
Fulfil team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	
Average / Total Marks:						

Lab Equipment Requirement

The following are the specification of the apparatus required for FEEE lab and number of apparatus required for the batch of 20 students.

Sl. No.	Name of Equipment and Specification	Quantity Required
1	Dual Channel 30 V, 2 A continuously variable DC Regulated Power Supply with Current and Overload Protection	05 Nos.
2	+/- 15 V, 2 A, fixed DC Regulated Power Supply	05 Nos.
3	Portable Moving Coil DC Voltmeters a) 0 - 1 V b) 0 - 10 V c) 0 - 30 V	Each 05 Nos.

4	Portable Moving Iron AC Voltmeters a) 0 - 300 V b) 0 - 600 V	Each 05 Nos.
5	Portable Moving Coil DC Ammeters a) 0 - 100 mA b) 0 - 1 A c) 0 - 2 A	Each 05 Nos.
6	Portable Moving Iron AC Ammeters a) 0 - 2 A b) 0 - 5 A c) 0 - 10 A	Each 05 Nos.
7	Watt-meters a) 150/ 300V, 2 A, UPF b) 300/ 600 V, 5/ 10 A, LPF	Each 02 Nos.
8	Rheostats – 25 Ohms, 50 Ohms, 150 Ohms, 220 Ohms (all rated at 3 A)	Each 05 Nos.
9	Rheostat Loads – 1 KW, 230 V	02 Nos.
10	Wire wound Resistors- 5 Ohms 2 Watts, 25 Ohms 5 Watts, 330 Ohms 2 Watts, 560 Ohms 2 Watts, etc.	Each 05 Nos.
11	Soldering Iron 60 W	05 Nos.
13	Single Phase Energy meter 10 A, 230 V, 50 Hz, Digital type	05 Nos.
14	Multi-meter Digital $\frac{3}{4}$ "	06 Nos.
15	Dual Trace Oscilloscope – 30 MHz	02 Nos.
16	Three Phase Induction Motors :1 HP – 440 V 50 Hz, 2 HP – 440 V 50 Hz.	Each 02 Nos.
17	Three phase DOL, Star-Delta, Auto transformer starter	Each 02 Nos.
18	UPS 1 KVA	01 Nos.
19	Battery Lead-Acid type, 140 A-hr and Hydrometers	02 Nos.

Sl. No.	Name of Equipment and Specification	Quantity Required
20	I C Trainer kit	05 Nos
21	Digital IC's 7400, 7402, 7404, 7408, 7486 etc	Each 10 Nos.
22	Wooden Wiring board (2x3) ft	10
23	Wiring accessories	

	2	<ul style="list-style-type: none"> a) PVC conduit - $\frac{3}{4}$" - 10 lengths b) Cap and casing - $\frac{3}{4}$" - 10 lengths c) Switches Single Pole- 5A, 230 V d) Switches two way – 5 A, 230 V e) 3 Pin Sockets 5A, 230 V f) Bulb Holders – 5 A, 230 V g) 3 Pin Plug 5A, 230 V h) 60 Watts Lamps i) 100 Watts Lamps j) 15 W CFL lamps k) Copper Wires of sizes 1.5 mm², 2.5 mm², 4 mm² – 1 coil each l) Gang boxes (1+1, 2+1, 2+2) m) Kit –Kat fuses 5A, 15 A n) MCB 16 A & 32 A/ 230 V, Single and Double Pole o) ELCB 16 A & 32 A/ 230 V, Double Pole p) Neutral link- 16 A, 230 V q) Screws of assorted sizes r) Testers 	Each 10 Nos.
24		<p>Electronic Components</p> <ul style="list-style-type: none"> a) Diodes - BY 127 and IN 4001 b) Zener Diodes – 6.2 V, 5.6 V, 7.8 V c) Relays – solid state Sugar cube type, SPST, Coil 6V, Power circuit 230 V, 5 A. d) Spring Boards e) Bread Boards f) Tag Boards. 	Each 10 Nos.
25		Simple PANEL BOARD/ CUBICAL consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.	1 No

Government of Karnataka

Department of Collegiate and Technical Education

Board of Technical Examinations, Bangalore

Course Code	20CS01P	Semester	I/II
Course Title	IT SKILLS	Course Group	ES/CS
No. of Credits	4	Type of Course	Lecture + Practice
Course Category	ES	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Basic Computer Skills	Teaching Scheme	(L:T:P)= 1:0:2
CIE Marks	60	SEE Marks	40

1. RATIONALE

Information Technology is crucial to the majority of the business and has a great influence on innovation and engineering. Every branch of engineering and every organization opt for computers and IT skills for business automation, communication/connectivity, resource planning, work automation and securing information etc. All engineering diploma students must be conversant with the basic IT skills which empower them to learn new technologies, adapt to changes, business development, communication etc.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences.

Perform jobs related to web design and maintenance, business process automation tool management, cyber security and safety and program assistant.

3. COURSE OBJECTIVES

1. Demonstrate the basics of coding.
2. Design and develop web pages that include static and dynamic content.
3. Describe the basic concepts of Cloud and IoT.
4. Express the workflow and business automation
5. Recognize the best practices of Cyber Safety and security.

4. JOB ROLE

SL.NO	LEVEL	JOB ROLES
1	3	Junior software developer - web.
2	3	Junior Creative Designer/Digital Artist

5. PREREQUISITES

STUDENT	Basic Computer skills (Students without basic computer skills should be taught basic skills)
TEACHER	Computer science faculty with required knowledge of IT Skills.

6. COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry oriented Cos associated with the above mentioned competency:

COURSE OUTCOME		UNIT LINKED	CL	LINKED PO	TEACHI NG HOURS
CO1	Illustrate the basics of coding and develop simple applications for android phones.	1	U, A	1,4,7	15
CO2	Design and Develop websites.	2	U, A	1,4,7	30
CO3	Identify Cloud Services IoT applications	3	U	1,4,7	12
CO4	Apply workflow and use ERP for a simple project plan	4	U	1,4,7	09
CO5	Implement best practices of cyber safety and security in the workplace.	5	U, A	1,4,7	12
TOTAL					78

Legends: R = Remember; U = Understand; A = Apply and above levels CL = Cognitive Level (Bloom's revised taxonomy)

8. INSTRUCTIONAL STRATEGY

These are sample strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Lecturer method(L) does not mean only traditional lecture method, but different type of teaching method and media visual/graphical content that are employed to develop the outcomes
2. Massive Open on-line courses (MOOCS) can be used to teach various topics/sub topics.
3. Online coding platform wherever mentioned.
4. Hands on coding should be practiced.
5. About 15 to 20% of the topics/sub topics which are relatively simpler or descriptive in nature is to be given to the students for self-directed learning

9. DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Topics/Sub topics	Unit skill set/Learning outcomes (In cognitive domain)	Hours L-T-P
1	UNIT 1 - INTRODUCTION TO BASICS OF CODING		05-0-10
	1.1 Introduction to computer programming 1.2 Algorithms –With sufficient examples 1.3 Flowcharts – With sufficient examples 1.4 Execute simple programs Note: Below listed or any other suitable online/offline coding platforms should be used to demonstrate and provide coding experience to students. a. https://scratch.mit.edu/	1. Understand computer programming 2. Create and write Algorithm for programmable problems. 3. Design Flowchart for programmable problems. 4. Develop simple Android application.	

	<p>b. https://studio.code.org/projects</p> <p>Suggested programs are listed in Table 1</p> <p>1.5 Introduction to Application development</p> <p>1.6 Simple android application development (No knowledge of programming language is required).</p> <p>Note:</p> <ul style="list-style-type: none"> i. <i>The purpose of application development is to ignite and promote programming skills.</i> ii. <i>Application development should be done using any App builder platforms such as</i> iii. <i>MITApp</i> <i>Inventor:</i> https://appinventor.mit.edu/ iv. <i>Thunkable:</i> https://thinkable.com/ v. <i>ibuildapp:</i> https://ibuildapp.com/ vi. <i>The student should be introduced to the android application development environment for further research and learning</i>https://developer.android.com/ <p>1.7 Activity: create a simple Android application (Unique for each student) publish on the learning management system.</p>		
2	UNIT 2 - DESIGN AND DEVELOP WEB PAGES		10-0-20
2	<p>2.1 Basic web technologies</p> <ul style="list-style-type: none"> ▪ Browser ▪ Web -Server ▪ Client-Server Model ▪ URL ▪ SEO techniques ▪ Domain names and domain name system. <p>2.2 Creating Web-pages with HTML5 - Static</p>	<ol style="list-style-type: none"> 1. Understand and examine basic web technologies 2. Creating static web pages 3. Formatting Webpages with cascading style sheets (CSS) 4. Creating Dynamic web pages with JavaScript 	

<p>web pages.</p> <ul style="list-style-type: none"> ▪ Introduction, Editors ▪ Tags, Attributes, Elements, Headings ▪ Links, Images, List, Tables, Forms ▪ Formatting, Layout, Iframes. <p>2.3 Formatting web pages with style sheets (CSS3).</p> <ul style="list-style-type: none"> ▪ Introduction to CSS ▪ Inline CSS, Internal CSS, Classes and IDs ▪ div, Color, Floating, Positioning ▪ Margins, Padding, Borders ▪ Fonts, Aligning Text, Styling Links <p>2.4 Creating a web page dynamic using JavaScript.</p> <ul style="list-style-type: none"> ▪ Dynamic web page and Introduction to JS ▪ Basic syntax ▪ Functions ▪ Events <p>Note: Refer https://www.w3schools.com</p> <p>2.6 Creating dashboards in websites.</p> <p>2.6 Activity: Personal website design and launch with a free platform or Create a Blogging website.</p> <ul style="list-style-type: none"> ▪ Online platforms (Learning and executing) ▪ https://www.w3schools.com/ ▪ https://studio.code.org ▪ https://www.khanacademy.org <p>Note:</p> <p>1) The student must be introduced to website development platforms - wordpress.com.</p> <p>2) The student must be made familiar</p>	<p>5. Creating and launching dashboard based personal website.</p>	
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	with launching websites . Certification available: <ul style="list-style-type: none"> • HTML - W3schools • CSS - W3schools • JavaScript - W3schools 		
3	UNIT 3 -BUSINESS PROCESS AUTOMATION/ERP		03:0:06
3	<p>3.1 Introduction to business process automation.</p> <p>3.2 Organization structure and functions composition-Properties and applications</p> <ul style="list-style-type: none"> ▪ Structure ▪ Types ▪ Functional Units <p>Note: Students should be made familiar with organization, types and components of a big enterprise to make him understand the working of organization keeping him as part of org.</p> <p>3.3 Workflows</p> <ul style="list-style-type: none"> ▪ Introduction ▪ Components ▪ Use and use cases <p>Note: Use free and open-source platform to demonstrate and create workflows.</p> <p>Example:</p> <p>https://airflow.apache.org/</p> <p>https://taverna.incubator.apache.org/</p> <p>https://trello.com/</p> <p>https://www.processmaker.com/</p> <p>3.4 Enterprise resource planning</p> <ul style="list-style-type: none"> ▪ History ▪ Evolution ▪ Uses of ERP ▪ ERP software tools. 	<ol style="list-style-type: none"> 1. Identify and examine the needs of business process automation. 2. Understand Organization structure and functions 3. Create and use workflows 4. Use Enterprise resource planning in workplace. 	

	<p>Note: The student should be introduced into Enterprise resource planning software tools to understand importance of ERP.</p> <p>Examples:</p> <ul style="list-style-type: none"> ▪ https://erpnext.com/ ▪ www.bitrix24.com ▪ https://www.odoo.com/ <p>3.5 Activity:</p> <ul style="list-style-type: none"> ▪ Project plan for summer internship - use open source ERP Software ▪ Identify different components of nearby organization with recourse plan and workflow design. ▪ Identify types of ERP software available with their market share. 		
4	UNIT 4 - INTRODUCTION TO CLOUD AND IOT CONCEPTS		04-0-8
	<p>4.1 Fundamentals of cloud</p> <p>4.2 Cloud service models</p> <ul style="list-style-type: none"> ▪ IaaS (Infrastructure-as-a-Service) ▪ PaaS (Platform-as-a-Service) ▪ SaaS (Software-as-a-Service) <p>4.3 Cloud deployment types</p> <ul style="list-style-type: none"> ▪ Public, ▪ Private, ▪ Hybrid ▪ Community Cloud <p>4.4 Cloud services:</p> <ul style="list-style-type: none"> ▪ Google Drive - file storage and synchronization service developed by Google; ▪ Google docs- bring your documents to life with smart editing and styling tools to help you easily format text and paragraphs; ▪ Google Co-lab (Usage of Jupyter Notebook): <i>Colab</i> notebooks allow you to combine 	<ol style="list-style-type: none"> 1. Understand Cloud concepts 2. Identify and use Cloud services 3. Understand IoT concepts 4. Identify IoT applications 	

	<p>executable code and rich text in a single document, along with images, HTML, LaTeX, and more.</p> <ul style="list-style-type: none"> ▪ Google App Engine: Google App Engine is a Platform as a Service and cloud computing platform for developing and hosting web applications in Google-managed data centers. Applications are sandboxed and run across multiple servers. <p>Note: Above cloud services are not compulsory for all branches; teacher can recommend other cloud service based on need of engineering branch.</p> <p>4.5 Working of IoT and IoT components (Only brief introduction and demonstration through videos)</p> <p>4.6 Explain concept of Internet of Things with examples</p> <ul style="list-style-type: none"> ▪ Smart home ▪ Smart city ▪ Smart farming <p>Note:</p> <p>a. Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.</p> <p>b. The students should be introduced to the IoT environment for further research and study.</p> <p>Example:</p> <ul style="list-style-type: none"> ▪ https://www.raspberrypi.org/ ▪ https://www.arduino.cc/ 		
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	4.7 Activity: Create your cloud service account and demonstrate using cloud services. Identify cloud service provider with respect to service models and deployment types. Identify areas where Internet of Things could bring positive changes.		
5	UNIT 5 - CYBERSECURITY AND SAFETY		4-0-8
	<p>5.1 Introduction to Cyber security and cyber safety.</p> <ul style="list-style-type: none"> ▪ Brief awareness on cyber safety measures ▪ Identification of basic security issues in mobile phones and personal computers ▪ Installation of Antivirus software ▪ Firewall concepts ▪ Browser settings ▪ Importance of privacy and Password policy (Best practices). <p>5.2 Common threats - Demonstration</p> <ul style="list-style-type: none"> ▪ Phishing ▪ DoS attack ▪ Man in the middle attack ▪ Eavesdropping ▪ Spamming <p>5.3 Activity</p> <ul style="list-style-type: none"> ▪ Identification of basic security issues in computers of your college and fixing the same. ▪ Visit nearby government organization. <ul style="list-style-type: none"> ▪ Identify basic cybersecurity issues and fixing the same ▪ Demonstrate the importance of cybersecurity, password policy, and cyber safety. 	<ol style="list-style-type: none"> 1. Identify need for Cyber security and cyber safety 2. Identify basic security issues in mobile phones and personal computers 3. Examine Importance of privacy, Password policy 4. Implement best practices of cyber safety and security in work place 	

10. SUGGESTED PRACTICAL SKILL EXERCISES**TABLE-I**

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO
1	Write an algorithm for programmable problems Example for Reference: <ul style="list-style-type: none"> Add/subtract two numbers Find the largest/smallest of 3 numbers Calculate and print sum of 'N' numbers 	1	1,4,7	1
2	Design a flowchart for programmable problems Example for Reference: Add/subtract two numbers Find the largest/smallest of 3 numbers Calculate and print sum of 'N' numbers	1	1,4,7	1
3	Design and create simple game using MIT-scratch/Code.org	1	1,4,7	1
4	Design and create simple android application (MIT App Inventor)	1	1,4,7	1
5	Design and create webpage for displaying your poem (Title, header, paragraph, formatting tags)	2	1,4,7	2
6	Design and create webpage for your wish list (What you want to do). Also list challenges and opportunities along with images to present your dreams (List ordered and unordered, Image, table)	2	1,4,7	2
7	Design and create webpage using HTML and CSS about an awesome animal (Use necessary CSS tags)	2	1,4,7	2
8	Design and create web page for a travel book/recipe book with more than 3 pages, table to list places/recipes (iframe, hyperlink)	2	1,4,7	2
9	Design and create web page with JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient	2	1,4,7	2
10	Design and create a personal webpage with dashboard	2	1,4,7	2
11	Design and create web page about advantages of business process automation with respect to your branch of engineering	2,3	1,4,7	2,3

12	Create a workflow for education loan approval in bank/diploma admission process (Use any tool)	3	1,4,7	3
13	Demonstrate ERP with ERPNext Demo for manufacturing, retail and service sector (Use any other ERP tools)	3	1,4,7	3
14	Create user account and demonstrate use of Google drive, Google docs, Google Co-lab (Usage of Jupyter Notebook)	4	1,4,7	4
15	1.1 Demonstrate Internet of Things using with examples a. Smart home b. Smart city c. Smart farming Note: Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.	4	1,4,7	4
16	Installation of Antivirus software	5	1,4,7	5
17	Demonstration and hands on browser settings	5	1,4,7	5
18	Demonstration and hands on privacy settings and password policy	5	1,4,7	5
19	Demonstration of common security threats (using videos) a. Phishing b. DoS attack c. Man in the middle attack d. Spamming e. Virus	5	1,4,7	5

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks. **The lecturer can enhance the competency level of the students by sketching more practical exercises.**

NOTES:

1. It is compulsory to prepare log book/record of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by the teacher
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Student activity is compulsory and part of skill assessment. The activity enable student to explore the course, help student to demonstrate creativity & critical thinking.
4. Student activity report is compulsory part to be submitted at the time of practical ESE
5. Term work report is compulsory part to be submitted at the time of practical ESE.

6. Student activity and student activity reports must be uploaded to Learning management system.
7. For CIE, students are to be assessed for Skills/competencies achieved.

11. MAPPING OF CO WITH PO

COURSE	CO'S	PROGRAMME OUTCOMES (PO'S)						
		1	2	3	4	5	6	7
IT SKILLS	CO1	3	0	0	3	0	0	3
	CO2	3	0	0	3	0	0	3
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	3
	CO5	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

12 SUGGESTED LEARNING RESOURCES

BOOKS	
1	The Art of Programming Through Flowcharts & Algorithms, A. B. Chaudhuri, Firewall Media publication
2	HTML5 Black Book, by Publishing company Limited. Kogent Learning Solutions Inc.
3	"World Wide Web design with HTML", Xavier, Tata McGraw-Hill
4	Internet of Things – A Hands on Approach, By ArshdeepBahga and Vijay Madiseti Universities Press, ISBN: 9788173719547
URL'S	
1	https://scratch.mit.edu
2	https://studio.code.org
3	http://ai2.appinventor.mit.edu
4	https://www.w3schools.com
5	https://www.tutorialspoint.com/javascript/index.htm
6	https://www.geeksforgeeks.org/html-tutorials/
7	Android https://developer.android.com
8	https://www.khanacademy.org
9	Tools for Web Development a. https://www.wix.com

	b. https://atom.io/ c. https://www.openelement.com/ d. https://www.layoutit.com
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13. SUGGESTED LIST OF PROPOSED STUDENTS ACTIVITY

Note: Refer activities mentioned in DETAILS OF COURSE CONTENT table

14. COURSE ASSESSMENT AND EVALUATION CHART

SL.N O	ASSESSMENT	DURATIO N (in minutes)	MAX MARKS	CONVERSION
1	CIE Assessment 1 (Written Test -1 TH) - At the end of 3 ^d week	60	20	Average of two written tests 20
2	CIE Assessment 2 (Written Test -2 TH) - At the end of 13 th week	60	20	
3	CIE Assessment 3 (Skill Test) - At the end of 5 th week	3 hrs	20	Average of three skill test 20
4	CIE Assessment 4 (Skill Test) - At the end of 7 th week	3 hrs	20	
5	CIE Assessment 5 (Skill Test) - At the end of 9 th week	3 hrs	20	
6	CIE Assessment 6 (Student activity)- At the end of 11 th week	-	20	20
7	Total Continuous Internal Evaluation (CIE) Assessment			60
8	Semester End Examination(SEE) Assessment (Practical Test)	3 hrs	100	40
TOAL MARKS				100
Note: CIE written test is conducted for 20 marks (Two sections). Each section shall have two full questions of same CL, CO. Student shall answer one full question from each section.				

15. RUBRICS FOR ACTIVITY

RUBRICS FOR ACTIVITY (Example Only)						
Appropriate rubrics shall be developed by the concerned faculty						
Dimension	Poor	Below Average	Average	Good	Exemplary	Student Score
	4	8	12	16	20	
Concept	Does not collect any information relating to the concept	Collects very limited information; some relate to the concept	Collect much information; but very limited relate to the concept	Collects some basic information; most refer to the concept	Collects a great deal of information; all refer to the concept	8
Design	Design is not acceptable/very poorly structured	Design is poor and not well structured.	Design Followed layout samples and well structured	Design & convey both content and context	Design considered all aspect of concept, concept and presentation (UI)	6
Creativity	Very little creativity in design/implementation	Creativity in concept or design or implementation	Creativity in concept /design/implementation	Creativity in concept /design/implementation which complements each other	Creative concept, content, presentation and implementation	8
Implementation	Poorly implemented	Partially implemented	Implemented on time with results (content)	Product convey both content and context	Product is creative with easy-to-use UI, structure	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8

16. RUBRICS for Skill Test Evaluation (Both for CIE & SEE)

Sl No	Parameter to be Observed	Marks Allotted
1	Design-Written Skill Test 1: Algorithm / Flowchart/Visual Design Skill Test 2: Web site visual design Skill Test 3: Work flow or Project plan or cyber security plan or Cloud service Concept	30
2	Implementation Skill Test 1: Android application Skill Test 2: Web site / Web pages Skill Test 3: Create or use cloud service account or Cyber safety and security- Antivirus Installation or browser settings	50
3	Appeal and Presentation	20
Total		100

17. SYSTEM REQUIREMENTS:

Sl. No.	Specification	Quantity
1.	Computers with HD Graphics Card	20
2.	Software: GIMP, KRETA, BLENDER, PHOTOSHOP or any other relevant open-source software.	-
3.	Internet Connectivity	-

Note: Above specification is for a batch of 20 students

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20ME21P	Semester	II
Course Title	MECHANICAL WORKSHOP PRACTICE-I	Course Group	Core
No. of Credits	4	Type of Course	Lecture& Practice
Course Category	PC	Total Contact Hours	6 Hrs Per Week
			78 Hrs Per Semester
Prerequisites	Drawing/Creativity	Teaching Scheme	(L: T:P)-1:0:2
CIE Marks	60	SEE Marks	40

1. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching learning experiences

Perform Repairing Work of Utility Jobs in the Mechanical Engineering Workshops

2. INSTRUCTIONAL STRATEGY

1. Instructor should expose to different tools used in respective shops, Operational safety and Procedure to be followed for prepare the model. Emphasis should be given on marking, operational sequence.
2. Focus should be on proper selection of tools and their proper use.

3. COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry-oriented Cos associated with the above-mentioned competency:

C01	Select hand tools and Machinery in different shops according to job
C02	Understand job drawing and complete jobs as per specifications in allotted time.
C03	Inspect the job for the desired quality and dimensions and position
C04	Operate, control different machines and equipment's adopting safety practices.

4. COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

SHOP	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 INTRODUCTION	Importance of trade Training. - General discipline in the Institute - Elementary First Aid. - Importance of carpentry /Fitter/Welding in Industry - Safety precautions to be followed in while doing wood working/fitting operations/ Shielded Metal Arc Welding, and Oxy- Acetylene Welding operations/,Oxy-acetylene cutting operations	1. Demonstration of Machinery used in the trade. 2. Identification to safety equipment and their use etc. 3. Hack sawing, filing square to dimensions. 4. Marking out on MS plate and punching.	01-00-02 (01 class of 3 Hr duration)
UNIT-2 BASIC ARTISAN SKILLS-CARPENTRY	1. Interpret given job drawing 2. Select the relevant carpentry tool for making the job 3. Describe the specified operations in the carpentry shop 4. Explain the maintenance procedure of the given tool/Equipment's in carpentry shop	1. Types of woods used in carpentry 2. Various Marking tools used in carpentry 3. Various Holding tools-used in carpentry 4. Various Planning tools-used in carpentry for planning practice 5. Various Cutting tools-saws-Cross cut saw ,Hand saw ,Rip saws,Tennon saw, Chisels-Firmer chisel, dove tail chisel, Mortise chisel in carpentry 6. Prepare two simple job(Male and female assembly type)as per given drawing with joint like mortise and tenon dovetail, bridle, half lap 7. Safe practices	06-00-12 (06 class of 3 Hr duration)

<p align="center">UNIT-3 BASIC ARTISAN SKILLS - FITTING</p>	<ol style="list-style-type: none"> 1. Interpret given job drawing 2. Select the relevant Fitting tool for making the job 3. Select the proper raw material for given condition 4. Describe the specified operations in the Fitting shop 5. Explain the maintenance procedure of the given tools/Equipments in fitting shop 	<ol style="list-style-type: none"> 1. Fitting tools-Bench vice-clamp 2. Various Marking & measuring tools-used in fitting practice 3. Various cutting tools used in fitting shop 4. Various finishing tools used in fitting practice 5. Fitting shop machine such as Drilling machine, power hack saw, grinding machine their specification, care and maintenance 6. Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc - safe practices 7. Prepare two simple job (Male and female assembly type) as per given drawing. 	<p align="center">06-00-12 (06 class of 3 Hr duration)</p>
<p align="center">UNIT-4 FABRICATION- ARC WELDING</p>	<ol style="list-style-type: none"> 1. Set the Arc welding machine and perform different type of joints on MS in different position observing standard procedure. 2. Arc welding equipment-Power sources for Arc Welding-Transformer 3. Various Arc welding tools 4. Technique of welding-Preparation of work, Striking of an arc, weaving, welding positions, weld joints <i>[different types of joints- Fillet (T- joint, lap & Corner), Butt (Square & V); different position - 1F, 2F,</i> 5. welding shop-Arc welding transformer specifications and maintenance 6. Safe practices 	<ol style="list-style-type: none"> 1. Describe the safety precautions to be taken for Arc welding activities. 2. Fix/hold the parts which need to be welded together as per Arc welding using a clamp and align them with the electrodes as per the job requirement so that the work pieces do not fall down/turn. 3. Fix the work pieces on the Arc Welding apparatus keeping in mind the electrode distance, contact area, 4. Monitor the Arc welding process by observing and communicating the readings on, various panels/ meters at the right 	<p align="center">05-00-10 (06 class of 3 Hr duration)</p>

		<p>time to prevent any harm to the work pieces due to overheating, burning and over melting.</p> <p>5. Remove extra material by using chippers, grinders etc.</p> <p>6. Shape the Arc welded work pieces as per requirement by hammering the bulges.</p>	
UNIT-5 FABRICATION- GAS WELDING	<ol style="list-style-type: none"> 1. Introduction and definition of gas welding. Gas Welding terms and definitions Various Gas welding tools and equipments 2. Setting of oxy-acetylene welding equipment, lighting and setting of flame. 3. Various Welding Processes and its applications. 4. Technique of Gas welding-Preparation of work, welding positions, weld joints 5. Perform fusion run without filler rod on MS sheet 2mm thick in flat position. 6. Set the gas welding plant and join MS sheet in different position. <i>[Different position: - 1F, 2F, 3F, 1G, 2G, 3G.]</i> 	<ol style="list-style-type: none"> 1. Describe the safety precautions to be taken for gas welding activities. 2. Fix/hold the parts which need to be welded together as per gas welding using a clamp and align them with the electrodes as per the job requirement so that the work pieces do not fall down/turn. 3. Fix the work pieces on the Gas Welding apparatus keeping in mind the flame distance, contact area, 4. Monitor the Gas welding process by observing and communicating the readings on various panels/ meters at the right time to prevent any harm to the work pieces due to overheating, burning and over melting. 5. Remove extra material by using chippers, grinders etc. 6. Shape the Gas welded work pieces as per requirement by hammering the bulges 	05-00-10 (05 class of 3 Hr duration)
UNIT-6 GAS CUTTING	<ol style="list-style-type: none"> 1. Common gases used for welding & cutting, flame temperatures and uses. 2. Chemistry of oxy-acetylene flame. 	<ol style="list-style-type: none"> 1. Setting up of oxy-acetylene and make straight cuts (freehand) 2. Perform marking and straight line cutting of MS 	03-00-06 (03 class of 3 Hr duration)

	3. Types of oxy-acetylene flames and uses. 4. Oxy-Acetylene Cutting Equipment principle, parameters and application.	plate 10 mm thick by gas. Accuracy within ± 2 mm. 3. Beveling of MS plates 10 mm thick, cutting regular geometrical shapes and irregular shapes, cutting chamfers by gas cutting. 4. Circular gas cutting on MS plate 10 mm thick by <i>profile cutting machine</i> . 5. Marking and perform radial cuts, cutting out holes using oxy-acetylene gas cutting. 6. Identify cutting defects viz., distortion, grooved, fluted or ragged cuts; poor draglines; rounded edges; tightly adhering slag	
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Sl.No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO	L:T:P Hrs.
1	1. Demonstration of Machinery /tools used in the trade. 2. Identification to safety equipment and their use etc 3. Identification of tools according to use. 4. Marking out on job and punching.	1	1,4	1-4	0:0:2
2	Identification of different wooden sample piece i.e. - soft wood & hard wood Demonstration of different wood working tools / machines. and ask students to write the wood working tools used in carpentry in work shop dairy (Do this exercise).	1	1,4	1-4	0:0:2
3	Demonstration of different wood working processes, like planing, marking,(Do this exercise) by issuing two wooden pieces	2	1,4	1-4	0:0:2
4	Demonstration of different wood working processes, like, chiseling, grooving and ask the students to do these process on issued wooden pieces (Do this exercise by issuing two wood pieces to student).	2	1,4	1-4	0:0:2
5	Does the female piece of wooden joint like any one joint (mortise and tenon dovetail, bridle, half lap (Not all) of issued one wooden piece and make the only one Female joint	2	1,4	1-4	0:0:2
6	Does the male piece of wooden joint like any one joint (mortise and tenon dovetail, bridle, half lap (Not all) of issued another wooden piece and make the only one male joint	2	1,4	1-4	0:0:2
7	Prepare Carpentry job(male and female assembly type)as per given drawing ,check the correctness of fit of mating parts (For Job Drawing models you can refer model question bank)	2	1,4	1-4	0:0:2

8	Demonstration of different fitting tools and drilling machines and power tools used in Fitting shop and ask students to write the fitting tools used in fitting shop in work shop dairy (Do this exercise).	3	1,4	1-4	0:0:2
9	Demonstration of different fitting processes filing, ask the students to do these process on issued metal pieces (Do this exercise by issuing two metal pieces to student).	3	1,4	1-4	0:0:2
10	Demonstration of different fitting processes like, cutting, ask the students to do these process on issued metal pieces (Do this exercise by issuing two metal pieces to student).	3	1,4	1-4	0:0:2
11	Prepare Fitting job(Male assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts JOB1(For models you can refer model question bank)	3	1,4	1-4	0:0:2
12	Prepare Fitting job(Female assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts JOB1(For Job drawing models you can refer model question bank)	3	1,4	1-4	0:0:2
13	Prepare Fitting job(male and female assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts (For models you can refer model question bank)	3	1,4	1-4	0:0:2
14	Straight line beads and Weaved bead on M. S plate 10mm thick in flat position.	4	1,4	1-4	0:0:2
15	Fillet "T" joint on M.S. Plate 10 mm thick in flat position and horizontal position.	4	1,4	1-4	0:0:2
16	Fillet lap joint on M.S. plate 10 mm thick in flat position and vertical position	4	1,4	1-4	0:0:2
17	Open Corner joint on MS plate 10 mm thick in flat position.	4	1,4	1-4	0:0:2
18	Single "V" Butt joint on MS plate 12 mm thick in flat position (1G) .	4	1,4	1-4	0:0:2
19	Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position.	4	1,4	1-4	0:0:2
20	Marking and straight line cutting of MS plate. 10 mm thick by gas. Square butt joint on M.S. sheet 2 mm thick in flat Position.	6	1,4	1-4	0:0:2
21	Fillet Lap joint on MS sheet 2 mm thick in flat position	5	1,4	1-4	0:0:2
22	Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position	5	1,4	1-4	0:0:2
23	Structural pipe welding butt joint on MS pipe Ø 50 and 3mm WT in 1G position	5	1,4	1-4	0:0:2
24	Setting up of oxy-acetylene and make straight cuts (freehand) and Perform marking and straight line cutting of MS plate 10 mm thick by gas. Accuracy within ± 2 mm.	6	1,4	1-4	0:0:2
25	Beveling of MS plates 10 mm thick, cutting regular geometrical shapes like rectangle, triangle, pentagon	6	1,4	1-4	0:0:2

26	Marking and perform radial cuts, cutting out holes using oxy-acetylene gas cutting	6	1,4	1-4	0:0:2
Total Hours					0:0:52 =52

MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	Experiment Linked	Cognitive Level R/U/A	Tutorial & Practical Sessions in Hrs
CO1	Select hand tools and Machinery in different shops according to job	PO1,PO4	All CO	A	20
CO2	Understand job drawing and complete jobs as per specifications in allotted time.	PO1,PO4	All CO	A	35
CO3	Inspect the job for the desired dimensions and shape.	PO1,PO4	All CO	A	13
CO4	Operate, control different machines and equipment's adopting safety practices.	PO1,PO4	All CO	A	10
					78

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
MECHANICALWORK SHOP-I	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

7. SUGGESTED LEARNING RESOURCES:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015.
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014.
3. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014.

4. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York.

8. SUGGESTED LIST OF STUDENTS ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Anyone)

1. Each student should conduct different activity and no repeating should occur

1	Take the students for industrial visit for a nearby welding shop; observe the safety practices followed and welding operational activities. Make hand written report
2	Take the students for local industry works observe the Fitting practices followed in the industry.
3	Ask the students to observe the carpentry operations carried out in local vicinity

9.Course Assessment and Evaluation Chart

Sl.No	Assessment	Type	Time frame in semester	Duration	Max marks	Conversion (End weightage)
1	CIE Assessment 1	GRADED EXERCISES	Average of all models evaluated in all shops (PORTFOLIO EVALUATION)	At the end of each model completion - At the end of 13 th week	20	20
2	CIE Assessment 2	Skill test-1- Carpentry	- At the end of 5 th week	3 Hrs	100	Average of three after converting for 20 Marks 20
3	CIE Assessment 3	Skill test-2- Fitting	- At the end of 9 th week	3 Hrs	100	
4	CIE Assessment 4	Skill test-3- Welding	- At the end of 13 th week	3 Hrs	100	
5	CIE Assessment 5	Student activity	- At the end of 12 th week		20	20
	Total Continuous Internal Evaluation (CIE) Assessment					60
	Semester End Examination(SEE) Assessment will be conducted for 100 marks and finally converted for weightage of 40 Marks			3Hrs	100	40
	Total					100
	Marks					

Note:

1. CIE Skill test is conducted for 100 marks (3 Hours duration) as per CIE scheme of evaluation. The obtained marks are scaled down to 20 marks.
2. SEE is conducted for 40 Marks for practical courses.
3. Each shop model in carpentry/fitting/Welding exclusively kept for skill tes-1,2,3 in CIE

4. In a batch of allotted students' model in carpentry, fitting and welding practice should be equally weighed, in CIE
5. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10. SCHEME for Portfolio Evaluation of Graded Exercise

	Sl No	Parameter Observed	Marks Allotted	Grand Total
Basic Artisan skills- Carpentry	1	Marking	4	20
	2	Tools Used	4	
	3	Operation Performed	4	
	4	Dimensional Accuracy	4	
	5	Finishing	4	
	Total		20	
	Basic Artisan skills - Fitting	Sl No	Parameter Observed		Marks Allotted
1		Marking	4	
2		Tools Used	4	
3		Operation Performed	4	
4		Dimensional Accuracy	4	
5		Finishing	4	
Total		20		
Welding	Sl No	Parameter Observed	Marks Allotted	
	1	Equipment Preparation	4	
	2	Job Preparation	5	
	3	Operation Performed	6	
	4	Finishing	5	
	Total		20	

11. SCHEME for Skill Test Evaluation/SEE for CIE

Sl.No	Particulars	Marks
1	Listing of tools & operations required for performing job	15
2	Marking of job	10
3	Operation performed	40
4	Dimensional accuracy of job	10
5	Finishing of job	20
6	Viva	5
Total		100

RUBRICS FOR ACTIVITY (10marks)						
Dimension	Beginning	Developing	Satisfactory	Good	Exemplary	Student Score
	2	4	6	8	10	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8 marks

Model Question Paper (suggestive only) Semester End Examination

Course & Programme: Semester: I/II

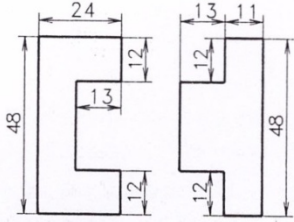
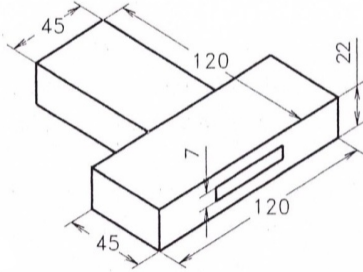
Subject : Mechanical Workshop Practice-1

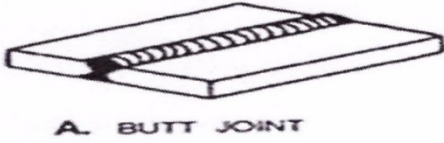
Max Marks : 100

Course Code : 20ME21P

Duration : 3Hrs

Instruction to the Candidate: ALL DIMENSIONS ARE IN MM ONLY

Qn.No	Question	CL	CO	PO	Marks
1	<p style="text-align: center;">Prepare model as per shown figure (Note: Either Male/female joint should be given)</p> <p>Example Make a square joint of the dimensions given in Figure using the given MS flat. The time allotted is 3 hours.</p>  <p style="text-align: center;">OR</p> <p>Make a mortise and tenon joint of size shown in Figure using the given wooden piece. Also prepare a dimensioned neat sketch of the joint.</p> 	A	1-3	1,4	40

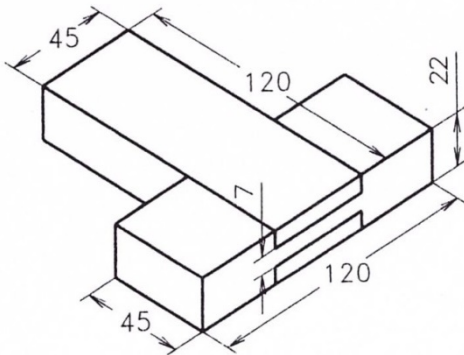
2	Prepare model as per shown figure				60
 <p>A. BUTT JOINT</p>					

Note: The models for respective shops should be given cyclically within the Batch for SEE/Skill test

MODEL QUESTION BANK (SUGGESTIVE ONLY)DEPARTMENT OF MECHANICAL ENGG.COURSE TITLE: ENGINEERING WORK SHOP**FOR CARPENTRY SHOP**

1.

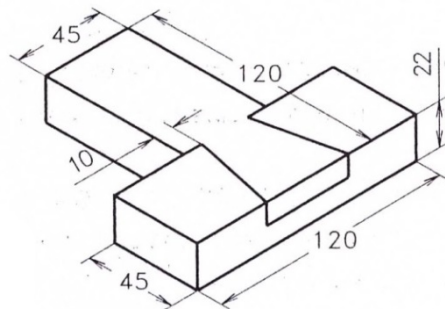
Figure shows drawing of a bridle joint. Copy the figure and make the joint using the given wooden piece.



2.

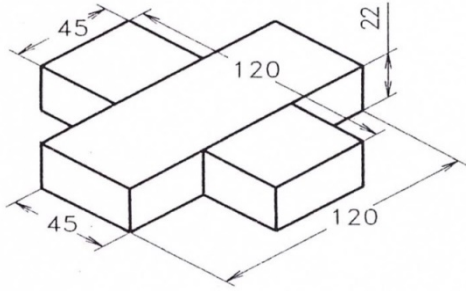
Make the following models, the allotted time is 3 hours:

Figure shows drawing of a dove-tail (halved) joint. Copy the figure and make the joint using the given wooden piece.



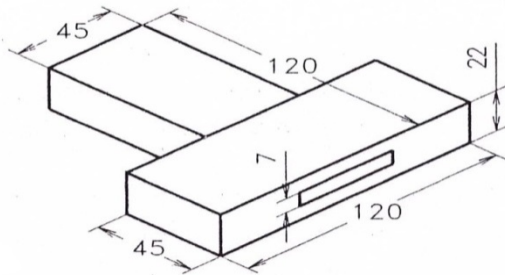
3.

Copy the sketch of the cross (halved) joint given in Figure and then make the joint using the given wooden piece.



4.

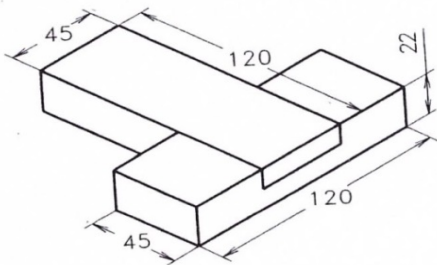
Make a mortise and tenon joint of size shown in Figure using the given wooden piece. Also prepare a dimensioned neat sketch of the joint.



5.

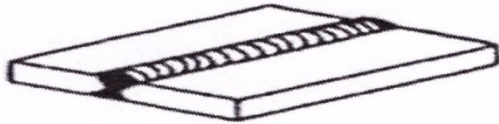
Example

Make a Tee (halved) joint of the dimensions given in Figure using the given wood piece. The time allotted is 3 hours.

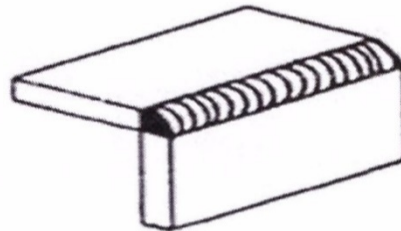


WELDING SHOP

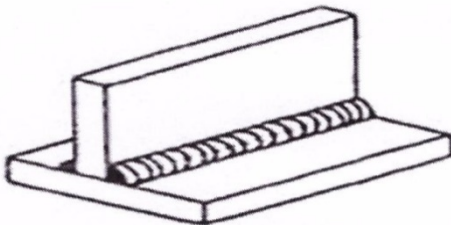
Copy the given sketch of the joint, then make the joint using the given MS flat piece.



A. BUTT JOINT



B. CORNER JOINT



C. TEE JOINT



D. LAP JOINT



THE WELDING INSTITUTE

Welding Positions: (As extracted from BS 499: Part 1: 1991 Figure 38)

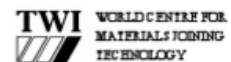
Graphical Representation for Butt Welds	UK (USA)	ISO/BS EN
<p>1G Flat Position (Rotated) Flat Position 1G</p>	1G	PA
<p>2G Horizontal Vertical Position 2G</p>	2G	PC
<p>3G Vertical Position</p> <p>PF Vertical up PG Vertical down</p>	3G	PF Vertical up PG Vertical down
<p>4G Overhead Position (Pipe axis fixed horizontal)</p>	4G	PE
<p>5G Vertical Position</p> <p>PF Vertical up PG Vertical down</p>	5G	PF Vertical up PG Vertical down
<p>6G Inclined Position (Fixed) 45°</p>	6G	H-LO45

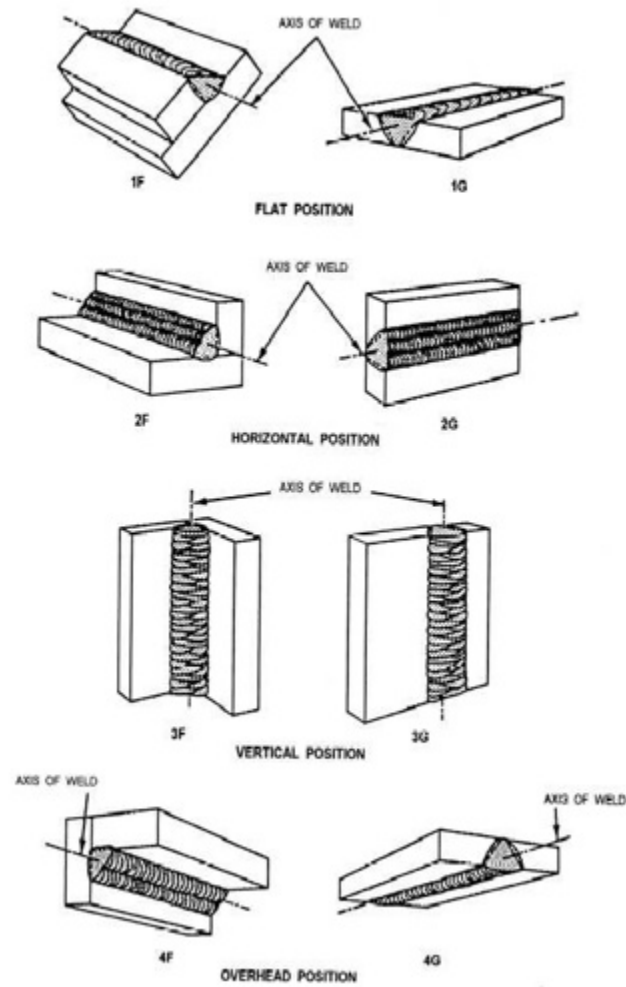
Welding Inspection of Steels WIS 5

2.16

Section 02 Terms & Definitions

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EQUIPMENT LIST**FOR CARPENTRY PRACTICE**

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Carpenter bench vice	20	20
02	G or C clamp 6"	20	20
03	Marking gauge	20	20
04	Try square 19mmx4"	20	20
05	Wooden mallet	20	20
06	Firmer chisel 2"	20	20
07	Firmer chisel 3/4"	20	20
08	Mortise chisel 1/2"	20	20
09	Metal jack plane 9"	20	20
10	Beveled square 6"	20	20
11	Hand saw or cross cut saw	20	20
12	Steel scale 12"	20	20

FOR FITTING PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Flat file 14" rough bastard file	20	20
02	Try square 6"	20	20
03	Triangular file 10" rough	20	20
04	Half round file 10" rough	20	20
05	Hack saw frame solid 12"	20	20
06	Center punch	20	20
07	Ball peen hammer 11/2 Lbs	20	20
08	Flat chisel 6"	20	20
09	Smooth file 10" flat	20	20
10	Bench vice 8"	20	20
11	Leg vice 6"	20	10
12	Power hack saw	20	01
13	Bench grinding	20	01
14	Bench drilling machine up to 12mm cap	20	01
15	Drill bit up to 12mm straight shank	20	04
16	Tap set and die set up to 1"	20	01
17	Vernier caliper	20	10
18	Spring divider	20	20
19	Steel scale	20	20
20	Vernier height gauge	20	01
21	Surface plate 2x3 feet	20	02
22	Number punch	20	01
23	Anvil	20	20
24	V block	20	02

FOR WELDING PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Arc welding transformer upto 300Amps	20	03
02	Welding shield	20	20
03	Ball peen Hammer 11/2 Lbs	20	10
04	Chipping Hammer	20	10
05	Wire brush	20	10
06	Anvil	20	01
07	Hand Gloves	20	05
08	Flat tongs	20	10
09	Steel scale	20	10
10	Flat file 14" rough bastard file	20	10
11	Oxygen cylinder	20	01
12	Acetylene cylinder	20	01
13	Gas welding torch	20	05
14	Spark lighter	20	05
15	Gas welding goggles	20	10
16	Gas cutting torch	20	02
17	Try square 6"	20	10

**ದ್ವಿತೀಯ ಸೆಮಿಸ್ಟರ್ ಕನ್ನಡ ಬಾರದ / ಕನ್ನಡೇತರ ಡಿಪ್ಲೋಮಾ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ
ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ
ಬಳಕೆ ಕನ್ನಡ - 1**

Course Code	20KA21T	Semester : II	Course Group – AU/KA
Course Title	ಬಳಕೆ ಕನ್ನಡ – I	Category : AU	Lecture Course
No. of Credits	2	Type of Course	CIE Marks : 50
Total Contact Hours	2 Hrs Per Week 26Hrs Per Semester	Teaching Scheme (L:T:P)= 2:0:0	SEE Marks : Nil

Table of Contents (ಪರಿವಿಡಿ)

Part – 1	Teaching Hour
Introduction to the Book, Necessity of learning a local language, Tips to learn the language with easy methods. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation. Instructions to Teachers for Listening and Speaking Activities.	02
Part – II	
Key to Transcription for Correct Pronunciation of Kannada Language, Instructions to Teachers to teach Kannada Language	02
Part – III Lessons to teach Kannada Language - Listening and Speaking Activities	
Lesson – 1 Personal Pronouns, Possessive Forms, Interrogative words	02
Lesson – 2 Possessive forms of nouns, dubitive question and Relative nouns	02
Lesson – 3 Qualitative, Quantitative and Colour Adjectives, Numerals	02
Lesson – 4 Predictive Forms, Locative Case	02
Lesson – 5 Dative Cases, and Numerals	02
Lesson – 6 Ordinal numerals and Plural markers	02
Lesson – 7 Defective / Negative Verbs and Colour Adjectives	02
Lesson – 8 Permission, Commands, encouraging and Urging words (Imperative words and sentences)	02
Lesson – 9 Accusative Cases and Potential Forms used in General Communication	02
Lesson – 10 Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs	02
Lesson – 11 Do's and Don'ts in Learning of Kannada Language (Any Language in General)	01
Lesson – 12 Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -	01
Kannada Words in Conversation	Total Teaching
Hours	26 Hours

**ದ್ವಿತೀಯ ಸೆಮಿಸ್ಟರ್ ಕನ್ನಡ ಬಲ್ಲ ಡಿಪ್ಲೋಮಾ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ
ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ
(ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಪರಂಪರೆ ಕುರಿತು)**

Course Code	20KA21T	Semester : II	Course Group – AU/KA
Course Title	ಸಾಹಿತ್ಯ ಸಿಂಚನ – ೧	Category : AU	Lecture Course
No. of Credits	2	Type of Course	CIE Marks : 50
Total Contact Hours	2 Hrs per Week 26 Hrs per Semester	Teaching Scheme (L:T:P)= 2:0:0	SEE Marks : Nil

ಸಾಹಿತ್ಯ ಸಿಂಚನ – ೧ (ಕಾರ್ಯಪುಸ್ತಕ) (20KA21T)

ಪಠ್ಯಪುಸ್ತಕದ ಪರಿವಿಡಿ	ಬೋಧನಾ ಅವಧಿ
1. ಕರ್ನಾಟಕದ ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ ಮತ್ತು ಸಾಹಿತ್ಯದ ಬೆಳವಣಿಗೆ	01 ಗಂಟೆ
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಸಂಕ್ಷಿಪ್ತ ಚರಿತ್ರೆ	01 ಗಂಟೆ
3. ಹಳಗನ್ನಡ ಸಾಹಿತ್ಯ - ಪಂಪ ಪೂರ್ವ ಯುಗ	
ಕನ್ನಡ ಸಾಹಿತ್ಯದ ರಚನೆಗೆ ಪ್ರಮುಖ ಪ್ರೇರಣೆಗಳು ಮತ್ತು ಪ್ರಭಾವಗಳು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಂಪರೆ ಮತ್ತು ರಾಜಾಶ್ರಯ ಕವಿರಾಜಮಾರ್ಗ ಮತ್ತು ವಡ್ಡಾರಾಧನೆ	03 ಗಂಟೆ
4. ಪಂಪ / ಚಂಪೂ ಯುಗದ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಮತ್ತು ಪರಂಪರೆ	
ಆದಿಕವಿ ಪಂಪ, ರನ್ನ, ಪೊನ್ನ, ಜನ್ನ, ಒಂದನೇ ನಾಗವರ್ಮ ಮತ್ತು ನಾಗಚಂದ್ರ 10 ಮತ್ತು 11ನೇ ಶತಮಾನದ ಸಮಕಾಲೀನ ಪ್ರಮುಖ ಕವಿಗಳು	04 ಗಂಟೆ
5. ನಡುಗನ್ನಡ ಸಾಹಿತ್ಯ - ವಚನ ಸಾಹಿತ್ಯ / ಬಸವ ಯುಗ	
ವಚನ ಸಾಹಿತ್ಯದ ಬೆಳವಣಿಗೆಗೆ ಕಾರಣಗಳು ಮತ್ತು ಅದರ ಮಹತ್ವ ಪ್ರಮುಖ ವಚನಕಾರರು, ವಚನ ಸಾಹಿತ್ಯದಲ್ಲಿ ವೈಚಾರಿಕತೆ ಮತ್ತು ಕಾಯಕ ತತ್ವ	04 ಗಂಟೆ
6. ಕುಮಾರವ್ಯಾಸ ಯುಗ ಮತ್ತು ಸಾಹಿತ್ಯದ ಇತರೆ ರೂಪಗಳು	
ರಗಳೆ - ಹರಿಹರ, ಷಟ್ಪದಿ - ಕುಮಾರವ್ಯಾಸ, ಲಕ್ಷ್ಮೀಶ ಮತ್ತು ರಾಘವಾಂಕ ಸಾಂಗತ್ಯ - ರತ್ನಾಕರವರ್ಣಿ,	04 ಗಂಟೆ
7. ದಾಸ ಸಾಹಿತ್ಯ / ಕೀರ್ತನೆಗಳು	02 ಗಂಟೆ
ಪುರಂದರದಾಸರು, ಕನಕದಾಸರು ಮತ್ತು ಇತರೆ ಕೀರ್ತನೆಕಾರರು	
8. ಇತರೆ ಸಾಹಿತ್ಯದ ಪ್ರಕಾರಗಳು	04 ಗಂಟೆ
ತ್ರಿಪದಿ - ಸರ್ವಜ್ಞ, ಜಾನಪದ ಸಾಹಿತ್ಯ, ತತ್ವಪದಗಳು - ಶಿಶುನಾಳ ಶರೀಫರು	
9. ಮಹಿಳಾ ಸಾಹಿತ್ಯ : ಹೆಳವನಕಟ್ಟೆ ಗಿರಿಯಮ್ಮ ಮತ್ತು ಸಂಚಿಹೊನ್ನಮ್ಮ, ಆಧುನಿಕ ಪೂರ್ವ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಕೆಂಪುನಾರಾಯಣ ಮತ್ತು ಮುದ್ದಣ	02 ಗಂಟೆ
10. ಹಳಗನ್ನಡ ಮತ್ತು ನಡುಗನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಒಂದು ಅವಲೋಕನ	01 ಗಂಟೆ
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ 26 ಗಂಟೆಗಳು	26 ಗಂಟೆ

ಬಳಕೆ ಕನ್ನಡ -I ಮತ್ತು ಸಾಹಿತ್ಯ ಸಿಂಚನ -೦೧ ಪಠ್ಯಕ್ರಮಗಳಿಗೆ ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ

ಮಾರ್ಗಸೂಚಿಗಳು

(COURSE ASSESSMENTS AND EVALUATION CHART- CIE ONLY)

Sl.No	Assessment	Type	Time frame in semester	Duration	Max marks	Conversion
1.	CIE Assessment 1	Written test-1	- At the end of 3 rd week	80 minutes	30	Average of three written tests-1,2,3 for 30 marks
2	CIE Assessment 2	Written test-2	- At the end of 7 th week	80 minutes	30	
3	CIE Assessment 3	Written test-3	- At the end of 13 th week	80 minutes	30	
4	CIE Assessment 4	MCQ/Quiz	- At the end of 5 th week	60 minutes	20	Average of three Assessment 4,5,6 for 20 marks
5	CIE Assessment 5	Open book test	- At the end of 9 th week	60 minutes	20	
6	CIE Assessment 6	Student activity & presentation	- At the end of 11 th week	60 minutes	20	
	Total Continuous Internal Evaluation (CIE) Assessment					50
				Total Marks		50



Government of Karnataka
Department of Collegiate and Technical Education

C-20 Second Year Diploma Curriculum Mechanical Engineering

Curriculum Development Cell, DTE
2021-22



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION
Curriculum Structure

III Semester Scheme of Studies- Diploma in Mechanical Engineering

Sl. No.	Course Category / Teaching Department	Course Code	Course Name	Hours per week			Total contact hrs /week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE marks)	Assigned Grade	Grade Point	SGPA and CGPA
				L	T	P			Max	Min	Max	Min					
Integrated Courses																	
1	PC/ME	20ME31P	Mechanics of Materials	3	1	4	8	6	60	24	40	16	100	40			Both SGPA & CGPA
2	PC/ME	20ME32P	Machine Tool Technology	3	1	4	8	6	60	24	40	16	100	40			
3	PC/ME	20ME33P	Manufacturing Processes	3	1	4	8	6	60	24	40	16	100	40			
4	PC/ME	20ME34P	Fluid Power Engineering	3	1	4	8	6	60	24	40	16	100	40			
Audit Course																	
5	AU/KA	20KA31T	ಸಾಹಿತ್ಯ ಸಿಂಚನ-II/ ಬಳಕೆ ಕನ್ನಡ-II	2	0	0	2	2	50	20	-	-	50	20			
Total				14	4	16	34	26	290	116	160	64	450	180			

***PC: Programme Core:: AU-Audit Course:: KA: Kannada:: L: Lecture:: T: Tutorial:: P: Practice**



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION
Curriculum Structure

IV Semester Scheme of Studies- Diploma in Mechanical Engineering

Sl. No.	Course Category / Teaching Department	Course Code	Course Name	Hours per week			Total contact hrs /week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE marks)	Assigned Grade	Grade Point	SGPA and CGPA
				L	T	P			Max	Min	Max	Min					
Integrated Courses																	
1	PC/ME	20ME41P	Operations Management	3	1	4	8	6	60	24	40	16	100	40			Both SGPA & CGPA
2	PC/ME	20ME42P	CNC Programming and Machining	3	1	4	8	6	60	24	40	16	100	40			
3	PC/ME	20ME43P	Product Design and Development	3	1	4	8	6	60	24	40	16	100	40			
4	PC/ME	20ME44P	Elements of Industrial Automation	3	1	4	8	6	60	24	40	16	100	40			
Audit Course																	
5	AU/ME	20ME45T	Indian Constitution	2	0	0	2	2	50	20	-	-	50	20			
Total				14	4	16	34	26	290	116	160	64	450	180			

***PC: Programme Core:: AU-Audit Course:: L: Lecture:: T: Tutorial:: P: Practice**

3rd SEMESTER



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	III
Course Code	20ME31P	Type of Course	Programme Core
Course Name	Mechanics of Materials	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale

In this course, Diploma engineers are required to analyse the reasons for failure of components and select the suitable materials for a given applications. For this purpose, it is essential to study the concepts, principles, applications and practices covering stress, strain, stress concentration, weak points, deformations, bending moment and shearing force. The students will also study the basic principles of Finite Elements Analysis and perform stress strain analysis using Ansys software to understand and quantify the effects of real-world conditions on a part. These simulations, will allow Diploma engineers to locate potential problems in a design, including areas of tension and weak spots. FEA becomes a tremendous productivity tool, helping engineers in reducing product development time and cost. Hence, FEA is introduced in this course. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles to the solution of applied problems and to develop the required skill and competencies

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Analyse Simple Stresses and Strains on given Structural member that is subjected to Tensile, Compressive and Shear loads by using Destructive Test.
CO-02	Draw Shear force Diagram (SFD) and Bending moment Diagram (BMD) and Also, Analyse Bending Stresses in a Beam using Finite element methods(FEM) software
CO-03	Demonstrate the application of finite element formulations to solve both One dimensional and Two dimensional Problems.
CO-04	Demonstrate the application of FEM software for Validation of both One dimensional and Two dimensional Problems

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01	1. Introduction to Force-Types of Forces-Resolution of forces	Refer Table 1	Resolution of forces by Graphical Method
			2. Problems on Resolution of forces- Analytical Method		Verification of Forces by Lami's Theorem
			3. Problems on Resolution of forces- Analytical Method		
2	01	01	1. Types of Loads-Tensile, Compression, Shear, Impact, Stress- Types- Strain- Types- - Hooks Law- Young's Modulus		Conduct Tensile test for the given Specimen and Determine Stress- Strain-Young's Modulus, Yield Stress- Maximum Stress-

			2. Stress - Strain Diagram - Elastic constants- Linear strain, Lateral Strain, Poisson's Ratio, Volumetric Strain, Bulk Modulus, Rigidity Modulus , Fatigue - Endurance Limit	Refer Table 1	Breaking Stress- % Elongation in Length and % Reduction in Area Also, Draw Stress- Strain Diagram for the above Parameters
			3. Stress concentration, Factor of Safety(FOS), Concept of Temperature stresses		
3	01	01	1. Simple Problems on Stress, Strain and Elastic constants	Refer Table 1	Conduct Compression test for the given Specimen and Determine Stress- Strain- Young's Modulus, Yield Stress- Maximum Stress- % Reduction in Length and % Increase in Area Also, Draw Stress- Strain Diagram for the above Parameters
			2.. Simple Problems on Stress, Strain and Elastic constants		
			3. Simple Problems on Stress, Strain and Elastic constants		
4	01	01	1. Problems on Members subjected to combined Stresses	Refer Table 1	Conduct Shear test for the given specimen
			2. Problems on Members subjected to combined Stresses		
			3. Problems on Members subjected to combined Stresses		
5	02	02	1. Types of Beams-Types of Loads acting on Beams- Concept of Shear force - Bending moment 2 Draw Shear force Diagram (SFD) and Bending Moment Diagram (BMD) for Cantilever subjected to Point Load and Uniformly Distributed loads (UDL) 3. Draw Shear force Diagram (SFD) and Bending Moment Diagram (BMD) for Cantilever subjected to Point Load and Uniformly Distributed loads (UDL)	Refer Table 1	Conduct Bending test for the given specimen

6	02	02	<p>1. Draw Shear force Diagram (SFD) and Bending Moment Diagram (BMD) for a Simply supported beam subjected to Point Load and Uniformly Distributed loads (UDL)</p> <p>2. Draw SFD and BMD for Simply supported and Cantilever beam subjected to Point Load and UDL Draw Shear force Diagram (SFD) and Bending Moment Diagram (BMD) for a Simply supported beam subjected to Point Load and Uniformly Distributed loads (UDL)</p> <p>3 Draw SFD and BMD for Simply supported and Cantilever beam subjected to Point Load and UDL Draw Shear force Diagram (SFD) and Bending Moment Diagram (BMD) for a Simply supported beam subjected to Point Load and Uniformly Distributed loads (UDL)</p>	Refer Table 1	<p>Present You tube videos in Stress, Strain and Bending Stresses on Different mechanical members</p> <p>Prepare a report on the observations made</p> <p>Eg: https://www.youtube.com/watch?v=C-FEVzI8oe8 </p>
7	02	02	<p>1. Pure Bending- Assumptions- Neutral Axis- Bending Equation</p> <p>2. Problems on Bending Equation</p> <p>3. Problems on Bending Equation</p>	Refer Table 1	<p>Present You tube videos in Stress, Strain and Bending Stresses on Different mechanical members</p> <p>Prepare a report on the observations made</p>
8	03,04	01	<p>1. Introduction to Finite Element Methods (FEM), Need-Back Ground</p> <p>2. Methods employed in FEM- Steps in FEM</p> <p>3. Advantages and Disadvantages, Limitations, Applications of FEM-Concept of Discontinuity</p>	Refer Table 1	Practice on FEM software (Eg: Ansys)
9	02,03,04	01,02,04	<p>1. Phases of FEA(Finite Element Analysis)</p> <p>2. Discretization Process</p> <p>3. Meshing –Element type</p>	Refer Table 1	Validate Bending Equation Problems solved in Week 7 using FEM software (Eg: Ansys)
10	02,03,04	01,02,04	<p>1. Stiffness Matrix of a Bar Element</p> <p>2. Global Stiffness Matrix- Properties of stiffness matrix</p>	Refer Table 1	Validate Bending Equation Problems solved in Week 7 using FEM software (Eg: Ansys)

			3. Boundary Conditions- Methods –Types		
11	03,04	02,04,07	Problems on 1-D elements	Study the latest technological changes in this course and present the impact of these changes on industry	Validate using FEM software (Eg: Ansys)
12	03,04	02,04,07	Problems on 1-D elements		Validate using FEM software (Eg: Ansys)
13	03,04	02,04,07	Problems on 2-D elements		Validate using FEM software (Eg: Ansys)
Total in hours			39	13	52

- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Coordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

TABLE 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution).

Sl. No.	Suggestive Activities for Tutorials
01	Understand Static Equilibrium using common examples, try to apply the principles and demonstrate in class the importance of static equilibrium in daily life, at home or at work.
02	Study the behavior of Aluminum under the action of Tensile/Compression Load. Plot Stress Strain Diagram and Demonstrate in the class the behavior of Aluminum different from that of a Cast Iron.
03	A seesaw is occupied by two children of equal weight “W” N. The center of gravity of each child is x meters from the fulcrum. The length of the board is 3x meters, y mm wide and z mm thick. Determine the maximum bending stress and shear stress in the board.
04	Tapered elastic bar subjected to an applied tensile load P at one end and attached to a fixed support at the other end. The cross-sectional area varies linearly from A_0 at the fixed support at $x = 0$ to $A_0/2$ at $x = L$. Calculate the displacement of the end of the bar (a) by modelling the bar as a single element having cross-sectional area equal to the area of the actual bar at its midpoint along the length, (b) using two bar elements of equal length and similarly evaluating the area at the midpoint of each, and compare to the exact solution By FEM.
05	Identify the type Beam in Traffic Light Post. Determine the displacement field for this beam subjected to UDL throughout its length.
06	Discuss procedure using the commercial package available today for solving problems of FEM. Take a Structural Problem to Demonstrate the same.
07	In 1989, Jason, a research-type submersible with remote TV monitoring capabilities and weighing 35 200 N, was lowered to a depth of 646 m in an effort to send back to the attending surface vessel photographs of a sunken Roman ship offshore from Italy. The submersible was lowered at the end of a hollow steel cable having an area of $452 \times 10^{-6} \text{ m}^2$ and $E = 200 \text{ GPa}$. Determine the extension of the steel cable. Due to the small volume of the entire system, buoyancy may be neglected.
08	Laboratory tests on human teeth indicate that the area effective during chewing is approximately 0.25 cm^2 and that the tooth length is about 1.1 cm. If the applied load in the vertical direction is 880 N and the measured shortening is 0.004 cm, determine Young’s modulus.

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Mechanics of Materials	Test	I/II/III	Sem	III
Course Code	20ME31P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions	Cognitive Levels(R/U/A)	Course Outcome	Marks	
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

5. (a) For CIE Skill Test -4

Duration :240Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	Verification of Forces by Lami's Theorem <ul style="list-style-type: none"> Finding the resultant of forces - Analytical Method –15 Marks Verification of Forces by Lami's Theorem – Practically-15Marks 	30
2	02	Determine the deformation of a given specimen subjected to Tensile/Compressive/Shear loads/Bending using UTM <ul style="list-style-type: none"> Writing observations and Tabular column -- 10 Marks Writing Equations required With all notations -- 10 Marks Conduction of Experiment --- 20 Marks Calculation and Result with Graph if any --- 20 Marks 	60
3	01,02	Portfolio evaluation based on the average of all Practice Sessions (1-6 weeks)	10
Total Marks			100

5.(b)For CIE Skill Test -5

Duration :240Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	Calculate and Plot SFD and BMD for the Given Data <ul style="list-style-type: none"> Finding Shear force and Bending Moment – (10+15)=25 Marks Plot SFD and BMD – 15 Marks 	40
2	03,04	Apply finite element formulations to solve the given One dimensional cases and Validate using Ansys <ul style="list-style-type: none"> Solve by FEM Method —25 Marks Validate Using FEM software (Eg: Ansys) ---25 Marks 	50
3	02,03, 04	Portfolio evaluation based on the average of all Practice Sessions (7-12 weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Schaum Outlines, "Strength of Materials", 5 Edition
2	RAMAMURTHAM. S., "Strength of Materials", 14th Edition, Dhanpat Rai Publications, 2011
3	KHURMI R S, "Applied Mechanics and Strength of Materials", 5 Edition, S.Chandand company
4	NASH W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co., New York, 1995.
5	RYDER G.H, "Strength of Materials", 3rd Edition, Macmillan India Limited, 2002.
6	BANSAL R. K, "Strength of Materials", Laxmi Publications, New Delhi, 2012.
7	Schaum series, Strength of Materials
8	TIMOSHENKO S.P, "Elements of Strength of Materials", Tata McGraw-Hill, Delhi,
9	Introduction to Finite Elements in engineering by TRIRUPATHI R, CHANDRUPATLA, ASHOK D BELEGUNDA, Pearson Publications.
10	Practical Finite Element Analysis by NITIN S GOKHALE,SANJAY S DESHPANDE, Finite to Infinite Publications
11	ANSYS free software tutorial((Student version) https://www.google.co.in/search?biw=1024&bih=667&q=ansys+software+tutorial&sa=X&ved=0ahUKEwj5oMndHNAhUBsI8KHbRWDhUQ1QIIXygE

8. LIST OF SOFTWARE/LEARNING WEBSITES

1. www.nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024htm
2. www.wikipedia.org/wiki/Shear_and_moment_diagram
3. www.freestudy.co.uk/mech%20prin%20h2/stress.pdf
4. www.engineerstudent.co.uk/stress_and_strain.html
5. www.ansys.com/Student
6. <http://www.mece.ualberta.ca/tutorials/ansys>

9. SEE Scheme of Evaluation

Duration: 180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01,02	<p>Determine the deformation of a given specimen subjected to Tensile/Compressive/Shear loads using UTM</p> <ul style="list-style-type: none"> • Writing observations and Tabular column -- 10 Marks • Writing Equations required With all notations -- 10 Marks • Conduction of Experiment --- 05 Marks • Calculation and Result with Graph if any --- 15 Marks <p>OR</p> <p>Calculate and Plot SFD and BMD for the Given Data</p> <ul style="list-style-type: none"> • Finding Shear force and Bending Moment – 10 Marks • Plot SFD and BMD – 15 Marks • Validate Using FEM software (Eg: Ansys) ---15 Marks 	40

2	03 , 04	Apply finite element formulations to solve the given One dimensional /Two dimensional cases and Validate using Ansys <ul style="list-style-type: none"> • Solve by FEM Method —20Marks • Validate FEM software (Eg: Ansys)---20 Marks 	40
3	01,02,03 ,04	Viva voce	20
Total Marks			100

10. Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Universal testing machine	Computerized 100 Ton Capacity With all attachments to conduct shear, bending , compression and tensile test	01
02	Ansys software		20 user
03	Desktop Computer	Latest configuration	10 nos



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	III
Course Code	20ME32P	Type of Course	Programme Core
Course Name	Machine Tool Technology	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: Diploma Engineers are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes is required to be imparted. The students are to be trained and equipped with adequate theoretical and practical knowledge about Metal Cutting Phenomenon and various processes like turning, drilling, milling, grinding etc. Hence, this course is introduced to provide hands on experience on various machine tools used in the manufacturing stream and to provide foundation for diploma engineers who want to further specialise in the field of precision manufacturing

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	List relevant work place Occupational health and safety standards and explain the importance of the need to comply with them.
CO-02	Explain the importance of Cutting tool Geometry, list various Cutting Parameters, the role and use of the right Coolants and Lubricants for the given machining processes.
CO-03	Demonstrate turning operation for a given component drawing and object, prepare a process chart and estimate the cost of its production as per drawing.
CO-04	Demonstrate milling and drilling operation needed as per a given component drawing, list all the machine tools needed for the operation, prepare a process chart and estimate the cost of its production as per the drawing.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	05	1. Educate about Safety standards Practiced in the machine Shop - Importance of housekeeping and good Shop floor Practices(5S) 2. Understand the Principles of First Aid. Preventive measures to be taken during Fire and Electrical emergency	Refer Table 1	1.Read and interpret the safety signs displayed in the Machine shop Instructor has to show various Safety sign charts and Personnel Protective Equipment (PPE) and ask the trainees to identify and record in the dairy 2.Read and interpret the PPE

			<p>Types of Fire extinguisher (Class A,B,C,D)</p> <p>3. Knowledge about Safety and Environment Regulations</p>		<p>First aid and basic training</p> <p>Identify and Segregate waste material (cotton waste, metal chips, burrs etc.)</p> <p>Arrangement of waste in bins</p> <p>3. Hazards identification and avoidance</p> <p>Preventive measure for electrical accidents</p> <p>Select the fire extinguisher according to type of fire</p> <p>4. Operate the Fire extinguisher and extinguish the fire</p> <p>Preventive measure for Oil leakages and related Hazards</p> <p>Practice the safety norms while working on Different Machine Tool</p>
2	02	01,04	<p>1 Lubrication- Need of Lubrication- Selection of Lubricant as per ISO standard.</p> <p>2.Theory of metal Removal- Traditional & Non Traditional material removal process- Chip forming & Non chip forming</p> <p>3. Types of cutting tools- Single point tools-Multi point tools – Specification of Single Point Cutting Tool, Parting , Knurling Tool, V- tool</p>	Refer Table 1	<p>1. Instructor has to display all the Lubricants used in the section and brief about its uses</p> <p>2. Select a Proper lubricant and demonstrate the lubrication of various m Ask the students to record in the Dairy</p> <p>3. Instructor has to show all the tools, machineries and measuring instruments used in the machine shop and brief about its uses. Ask the students to record in the Dairy.</p> <p>4. Identify the type of Chips formed and record in the dairy</p>
3	02	01	<p>1. Grinding- Abrasives- Applications of Natural abrasives- sand stone (Quartz), Corundum and Emery Diamond and Garnets- Application of Manufactured Abrasives- Silicon Carbide, Aluminum Oxide Cubic boron Nitride</p> <p>2. Explain – Grit, Grade, Structure, Bond, Type ISO Designation of Grinding Wheels</p> <p>3. Tool Geometry-Tool materials and Designation-Tool life & Wear</p>	Refer Table 1	<p>1. Practice on Grinding machine</p> <p>2 Grinding Practice of Single point tool as per tool Geometry</p>

			Concept of Cutting speed-Depth of cut-Feed		
4	03	01	<p>1.Introduction to Surface Texture- Indication of Roughness Symbols-Complete surface symbol chart, Grade and Numbers,- Tolerances- Unilateral and Bilateral</p> <p>2.Introduction to Lathe-Types of lathe- Capstone and Turret Lathe, Automatic Lathe and others - Specification of a Center Lathe -. Cutting Fluids- Selection of cutting fluids-</p> <p>3.Explain Work holding Devices- Tool Holding Devices</p>	Refer Table 1	<p>1. Read and interpret the Surface finish and Tolerances in the given Production drawing.</p> <p>2. Identify the main Parts of Lathe and its functions Identify the movements in Lathe Parts</p> <ul style="list-style-type: none"> • Carriage • Cross Slide • Tail Stock <p>3. Remove the Chuck from Spindle Nose and again mount on it</p> <p>4. Demonstration of holding Work piece in 3-Jaw and 4-Jaw chuck</p> <p>5. Idle operation of Lathe. Rotation of spindle in Clockwise and Counter clockwise direction</p> <p>6 .Identify the Lubrication Parts in Lathe</p> <p>7. Set the Spindle speed - Feed -Lever Position.</p>
5	03	01,02, 04	<p>1.Explain Plain turning, Step turning, Knurling and Chamfering Operations</p> <p>2. Prepare the Process plan as per the given drawing for Plain Turning, Step Turning, Knurling and Chamfering</p> <p>2.Estimate the Production cost per Piece as per the given drawing for Plain Turning, Step Turning, Knurling and Chamfering (Consider all Direct and Indirect costs)</p>	Refer Table 1	<p>1. Read and Understand the given Drawing</p> <p>2. Select the suitable Raw material</p> <p>3. Fix the given material between headstock and Tail Stock after performing Facing and Countersinking.</p> <p>4. Select the Speed and Feed</p> <p>5. Select and set the appropriate cutting tools as per the sequence of operations</p> <p>5 Perform all operations as per the process plan</p> <p>6. Check the dimensions using measuring instruments</p> <p>7. Observe and Identify the Chip Formation</p>
6	03	01,02, 04	1.Explain Taper turning operations by different methods- Calculate Taper angles for	Refer Table 1	1. Read and Understand the given Drawing

			<p>different Taper turning component Drawings</p> <p>2. Prepare the Process plan as per the given drawing for Taper Turning</p> <p>3. Estimate the Production cost per Piece as per the given drawing for Taper Turning(Consider all Direct and Indirect costs)</p>		<p>2. Mark the required dimensions as per the given drawing for Taper turning</p> <p>3. Fix the given material between headstock and Tail Stock</p> <p>4. Select and Set the tools to perform Taper turning</p> <p>5. Select the Speed and Feed</p> <p>6. Perform the Taper Turning operations and record the machining time.</p> <p>7. Measure the Taper angle in the given specimen using Bevel Protractor</p>
7	03	01,04	<p>1.Explain Thread cutting Mechanism</p> <p>a) Half Nut Mechanism</p> <p>b) Tumbler Gear Mechanism</p> <p>2. Prepare the Process plan as per the given drawing for Thread cutting</p> <p>3. Estimate the Production cost per Piece as per the given drawing for Thread cutting (Consider all Direct and Indirect costs)</p>	Refer Table 1	<p>1. Read and Understand the given Drawing</p> <p>2. Fix the given material between headstock and Tail Stock</p> <p>3. Select and Set the tools to perform Thread cutting operations</p> <p>4. Select the Speed, Feed and lubricant</p> <p>5. Perform the thread cutting operations Measure the Pitch of the thread for the given specimen by using Pitch Gauge</p>
8	04	01,04	<p>1. Introduction to Milling – Types of milling machine – Specification of a Milling machine</p> <p>2. Types of Milling cutters and their uses- Milling Cutter Nomenclature- Specification of Milling Cutter</p> <p>3. Methods of Milling-Up Milling and Down Milling- Work holding devices</p>	Refer Table 1	<p>1. Identification of Milling machine Parts and its Usage</p> <p>2. Demonstrate the working Principle of Milling machine and movements of Table and Arbor</p> <p>3. Setting of Vice and Job on the Table of Milling Machine</p> <p>4. Set the Cutter on the Arbor</p> <p>5. Illustrate the safety points to be observed while working on the Milling machine</p> <p>6. Identify and Select the different Milling Cutters</p> <p>7. Demonstrate the Up-milling and Down – Milling Process</p>
9	04	01,02, 04	<p>1.Explain Plain Milling Operation</p> <p>2.. Prepare the Process plan as per the given drawing(Solid Block) for Plain Milling</p> <p>3. Estimate the Production cost per Piece as per the given drawing for Plain Milling</p>	Refer Table 1	<p>1. Perform Plain Milling of Six faces of a Solid Block</p> <p>2. Check the accuracy of the Job with suitable Measuring Instruments</p>

			Operation (Consider all Direct and Indirect costs)		
10	04	01,02,04,07	1.Explain Key way and V- slot Operation 2. Prepare the Process plan as per the given drawing for Key way and V- slot 3. Estimate the Production cost per Piece as per the given drawing for Key way and V- slot	Study the latest technological changes in this course and present the impact of these changes on industry	1. Perform Milling of Keyway and V Slot 2. Check the dimensional accuracy with suitable Measuring Instrument
11	04	01,02,04,07	1. Explain Gear cutting by Indexing Methods 2. Prepare the Process plan as per the given drawing for Gear cutting 3. Estimate the Production cost per Piece as per the given drawing for Gear cutting		1. Demonstrate Indexing Head 2. Set and Align Indexing Head with reference to the Job on Milling machine Table 3. Perform Gear Teeth on a Blank by Simple Indexing Method

12	04	01,02, 04,07	<p>1. Introduction to Drilling – Types of Drilling Machines- Specification of Drilling Machines-Specification of Drill Bit, Reamer , Die and Taps</p> <p>2. Nomenclature of Drill Bit, Reamer, Die and Taps- Standard sizes of Drill Bits Explain Operations performed in Drilling Machines- Drilling, Counter sinking, Reaming, Boring, Tapping</p> <p>3. Prepare the Process plan as per the given drawing and Estimate the Production cost per Piece as per the given drawing</p>		<p>1. Identification of Drilling machine Parts</p> <p>2. Demonstrate the working Principle of Drilling machine</p> <p>3. Set the Vice and Job on the Table of Drilling machine</p> <p>4. Illustrate the safety points to be observed while working on the Drilling machine</p> <p>5. Identify and Select the different Drill Bits</p> <p>6. Set the Drill bits on the spindle.</p> <p>7. Drill Equally spaced holes (Circular/Square/Rectangular plate)</p> <p>8. Finish the pre-drilled hole with a Reamer</p>
13	01, 02, 03, 04		<p>Demonstrate the manufacturing of following components using YouTube Videos</p> <ol style="list-style-type: none"> 1. Fasteners 2. Propeller Shaft 3. Gears 4. Piston manufacturing <p>Discuss and Prepare a Report on the videos Presented for each manufactured component.</p>		<p>Demonstrate the manufacturing of following components using YouTube Videos</p> <ol style="list-style-type: none"> 1. Tube and Piston Rod Manufacturing. 2. Cylinder manufacturing etc., 3. Single point tool 4. Drill bits Etc. <p>Discuss and Prepare a Report on the videos Presented for each manufactured component</p>
Total in hours			39	13	52

- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Coordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	<p>Present a report on Machine safety Guidelines as per the Applicable standard Guide lines (CSA Standard Z 432-04 (R 2009)) including hazards associated with machines , Power tools, Machine Shop. Also Discuss general controls for reducing machine Hazards.</p> <p>https://ehs.utoronto.ca</p>

02	Discuss Common grinding Problems And their Remedies. Also discuss the need for Balancing the Grinding Wheels.. https://www.Euromarcconz
03	Whether it's granite for your countertops, backsplash, or floor tiles, making pristine cuts can be achieved with proper precautions, techniques, and specialized granite cutting tools for making tiles and slabs of this hard rock. Discuss and present a report on those tools.
04	Present a Report on Applications of Inversions of Kinematic Mechanisms: With-worth quick return motion mechanism in Shaper Double-slider crank mechanism
05	Present a Case Study on Machine tool chatter arising in an interrupted turning process https://core.ac.uk/download/pdf/33663698.pdf
06	Present a Report on Influence of Cutting Parameters on cutting force and Surface finish in Turning operation https://www.sciencedirect.com
07	Analyse tolerances in a Production Drawing
08	Analyse Surface finish symbols in a Production Drawing
09	Demonstrate the various measuring instruments used in Machine Shop
10	Collect the sample piece of various raw materials used in machine shop and Discuss their mechanical, chemical and Physical properties

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3.	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5.	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Machine Tool Technology	Test	I/II/III	Sem	III
Course Code	20ME32P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels(R/U/A)	Course Outcome	Marks
I	1				
	2				
II	3				
	4				
III	5				

	6			
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.				

5. (a) For CIE Skill Test -4

Duration: 240Min

SL. No.	CO	Particulars/Dimension	Marks
1	03	Question on Turning operations with Process plan, Production Cost of the product for a Given parameters <ul style="list-style-type: none"> Process plan includes Component Drawing ,process list and Tool selection=25marks Costing includes Raw material ,process and finding Total cost , selling Price and cost of scrap =25marks Performance of Turning and Taper turning operations(20+15)=35 marks Dimensional accuracy=05 Marks 	90
2	01,02,03	Portfolio evaluation based on the average of all Practice Sessions (1-6 weeks)	10
Total Marks			100

5. (b) For CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	04	Question on Milling operations with Process plan and Production Cost of the product for a Given parameters <ul style="list-style-type: none"> Process plan includes Component Drawing , process list and Tool selection= 20marks Costing includes Raw material ,process and finding Total cost , selling Price and cost of scrap = 30marks Performance of Milling operations including Key/Slot/Gear teeth cutting operations (20+15)= 35 marks Dimensional accuracy=05 Marks 	90
2	03,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 Weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Mechanical estimation and costing T.R.Banga and S.C.Sharma Khanna publishers
2	Mechanical Estimation Malhotra
3	Industrial Organization and Engineering Economics T.R. Banga and S.C.Sharma Khanna publishers
4	Mechanical Estimation NITTTR Chennai NITTTR Chennai
5	Mechanical costing and Estimation. Singh and Khan Khanna Publishers
6	Process Planning & Cost Estimation M.Adithan New age International
7	Rao, P.N., Manufacturing Technology, Vol I & II, Tata Mcgraw Hill Publishing Co., New Delhi, 1998
8	Serapekalpakjian, Steven R Schmid Manufacturing Engineering and Technology- Pearson Education-Delhi
9	Sharma, P.C., A Textbook Of Production Technology – Vol I And II, S. Chand & Company Ltd., New Delhi, 1996
10	HMT – “Production Technology”, Tata Mcgraw-Hill, 1998

8. LIST OF SOFTWARES/ LEARNING WEBSITES:

- 1.<http://calculatoredge.com/index.htm#mechanical>
- 2.www.nptel.ac.in/courses/112105126/36
- 3.www.youtube.com/watch?v=T5gkYvMg8A
- 4.www.youtube.com/watch?v=ESKoaZtoB1E
- 5.www.freevideolectures.com

9. SEE Scheme of Evaluation

Duration: 180min

SL. No.	CO	Particulars/Dimension	Marks
1	03,04	<p>Question on Turning operations with Process plan and Production Cost of the product for a Given parameters</p> <ul style="list-style-type: none"> • Process plan includes Component Drawing, process list and Tool selection= 20marks • Costing includes Raw material ,process and finding Total cost , selling Price and cost of scrap =25 marks • Performance of Operations =30marks • Dimensional accuracy=05 Marks <p style="text-align: center;">OR</p> <p>Question on Milling operations with Process plan and Production Cost of the product for a Given parameters</p> <ul style="list-style-type: none"> • Process plan includes Component Drawing, process list and Tool selection= 20marks • Costing includes Raw material, process and finding Total cost , selling Price and cost of scrap = 25marks • Performance of Milling operations including Key/Slot/Gear teeth cutting operations (20+10)= 30 marks • Dimensional accuracy=05 Marks 	80
2	01,02, 03,04	Viva voce	20
		Total Marks	100

10. Equipment list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Center lathe With all accessories and attachments(Gear driven)	Max 50mm Dia Holding capacity 500mm Center distance .Swing over dia 200mm	20
02	HSS cutting tool	20*20*150MM	40
03	HSS cutting tool	10*10*150MM	20
04	Cemented carbide tipped tools with holder brazed	For turning	20
05	Knurling tool Rough	Standard	10
06	Knurling tool Smooth	Standard	10
07	Vernier calipers	300mm	20
08	Outer caliper	50mm OD	20
09	Steel scale	300mm	20
10	Dial gauge for setting of work	Standard	10
11	Counter sunk Drill Bit	6mm Taper shank	20
12	Upright Drilling Machine	Upto 24mm drill With all attachment	01
13	Sensitive Drilling Machine	Upto 18mm drill	01
14	Machine Vice (To hold Job)	120mm Jaw Gap	05
15	Drill Bit set	6mm to 24mm	10 set
16	Marking Divider	200mm dia	
17	Marking punch	Standard	20nos
18	Combination Set Square	Standard	10 nos
19	Surface plate	300*300mm	01 no
20	Column and Knee type Vertical MILLING machine With all attachments	.Table Travel of 800mm .24mm cutters Bore dia (ID)	01no
21	Plain milling Cutter 24mm ID/Slab milling	Standard Size for Practice	05
22	Key way cutter	6mm	10
23	Key way cutter/Slot cutter	12	10
24	Gear cutter (Spur teeth)	Standard Size for Practice	10
25	Concave Milling cutter	Standard for Size Practice	10
26	Convex Milling cutter	Standard Size for Practice	10
27	Key way Milling cutter	40mm dia	10
28	End Milling Cutter	24mm dia	10
29	Bench Grinder	300mm wheel dia Rough and Smooth	02



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	III
Course Code	20ME33P	Type of Course	Programme Core
Course Name	Manufacturing Processes	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: Diploma Engineers are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is essential. This requires training the students in casting and metal forming domain so as to equip them with adequate theoretical and practical knowledge about the various metal casting and forming processes like rolling, forging, drawing, extrusion, Sheet metal work etc. Hence this course is introduced to provide hands on experience on various manufacturing processes.

2. Course Outcomes: At the end of the Course, the student will be able to

CO-01	Produce patterns, moulds, and casting of a given component drawing and estimate the cost of casting.
CO-02	Demonstrate forging operation for a given component drawing and estimate the cost of forging.
CO-03	Prepare sheet metal drawing, demonstrate sheet metal operation and estimate the costs of Sheet metal operation.
CO-04	Explain rolling and extrusion operation and list applications of metals forming processes.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01,04	1. Introduction to foundry – You tube videos on foundries Explain the safety Precautions to be taken in foundries 2. Explain the need of a Pattern- Types of Patterns—Solid or Single Piece pattern, Split Pattern, Loose Piece Pattern, Match Plate Pattern, Gated Pattern, Sweep Pattern, Skeleton-Pattern 3.Allowances- Materials used for Pattern	Refer Table 1	1. Identify the tools and equipment used in foundry with application 2. Prepare a single Piece wooden Pattern considering all allowances
2	01	01,04	1. Molding Sand-Types 2. Ingredients and Properties of Molding Sand	Refer Table 1	1. Prepare a molding sand 2. Preparation of Mold with the help of Pattern

			3. Importance of Core and Core prints-Gates-Runner-Riser		3. Melt the metal (wax) and pouring it into the mold cavity
3	01	01,04	1. Explain Defects in Casting 2. Inspection of Casting 3. Determination of Production Cost of a given material considering Raw material, Process cost, Overheads and other expenses	Refer Table 1	1. Cutting Runner and riser in the casted component 2. Cleaning of the casted component 3. Inspection of the casted component 4. Record the defects, if any
4	02	01,04	1.Introduction to basic Metal Forming Process and Applications- Show You tube Video's on Metal Forming Process 2. Explain Hot and Cold Working Process with Application Show You tube Videos on Hot and Cold Working Process 3.Introduction to forging operation- Types of forging- Hand forging and Power forging	Refer Table 1	1.Demonstrate safety precautions to be followed in Forging 2. Identify the tools and equipment's used in forging 3. Forging Practice (Hammering)
5	02	01,04	1.Explain forging Operations - Upsetting, drawing down, Cutting, Bending 2. Explain Punching and Drifting, Setting down and Finishing, Forge Welding 3 Estimation of Length of Raw material required to convert Circular rod to Square and Calculate the Production Cost considering direct and Indirect expenses.	Refer Table 1	Conversion of Circular rod to Square
6	02	01,04	1. Estimation of Length of Raw material required to convert Circular rod to Hexagon and Calculate the Production Cost considering direct and Indirect expenses. 2. Explain the working principle of Power hammer 3. Show the you tube videos on components produced by Power forging	Refer Table 1	Conversion of Circular rod to Hexagon
7	02	01,04	1. Estimation of Length of Raw material required to convert Hexagon to " L " shaped Nail and Calculate the Production Cost considering direct and Indirect expenses 2. Explain Forging losses- Forging Defects	Refer Table 1	Conversion of Hexagon to " L " Nail as per the given drawing

			3. Show the you tube videos on components produced by forging operations		
8	03	01,04	1.Introduction to sheet metal- Show You tube videos on sheet metal operations and Applications 2.Explain sheet metal materials – Standard Gauges of sheet - Specification of Sheet 3.Explain different Sheet metal operations	Refer Table 1	1. Identify and demonstrate the various tools used for sheet metal operations. 2. Measure the gauges of sheet 3. Demonstrate the operations performed on Shearing machine
9	03	01,04	1.Explain the Development of Cone and Cylinder 2. Explain the Development of Prism and Pyramid 3. Explain the Development of Funnel	Refer Table 1	1. Prepare Cone, Cylinder, Prism, Pyramid and Funnel 2. Join end surfaces by means of Seam Joint
10	03	01,04	1.Explain the Development of Tray 2.Explain the Development of Transition pieces 3. Explain the Development of Transition pieces	Refer Table 1	1. Prepare a Tray 2. Prepare any Transition Piece
11	03	01,04 07	1. Find the total Production cost of a sheet metal components like Open container, Cylindrical Drum 2. Introduction to Power Press -Press size- Press tools – Die Accessories 3. Types of Die and its operations	Study the latest technological changes in this course and present the impact of these changes on industry	1. Present You tube Videos on Press work operations 2. Record the observations made and prepare a report.
12	04	01,07	1.Introduction to Rolling- Nomenclature of Rolled Products- Dies used in rolling process 2.Types of Rolling mills-2 high mill- 3 High mill – 4 High mill- Cluster mill, Tandem Mill, Planetary mill, Defects in Rolling 3. Introduction to Extrusion and Drawing – Types of Extrusion Process. Wire and Tube Drawing Process, Dies used in Extrusion and Drawing Process		Video/ Virtual exposure on Rolling and Extrusion
13	04	01,07	Demonstrate the manufacturing of following components using YouTube Videos 1. Crank Shaft 2. Valves 3. Wheel 4. Gear case 5. Hair springs		Demonstrate the manufacturing of following components using YouTube Videos 1. TMT Steels 2. Channel sections 3. Pump Casings 4. Rolling of Sheets

			Discuss and Prepare a Report on the videos Presented for each manufactured component		5. Tooth paste tube 6. Pipes 7. Tubes etc., Discuss and Prepare a Report on the videos Presented for each manufactured component
Total in hours			39	13	52

- *PO= Program Outcome as listed and defined in year 1 curriculum
- Course Coordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	From heavy casting of 300Kg to small casting of 30 kg, investment casting method is used for as wide for hi-tech industrial applications. Investment casting is largely relied on for complicated designs that cannot be casted using any other method. Discuss. Also, Present the Preparation of Patterns for the Process. Compare the relative surface finish of this process with other Casting Processes.
02	Discuss the forging defects commonly occurring in forgings, their causes and Remedies. Present the methodology for measuring Forging defects. https:// studentlesson.com
03	A Gas cylinder is produced by Sheet metal operations. Prepare the development and Present the procedure involved in making the given component.
04	Identify the forming process adopted in making Tooth Paste Tubes. Present the process. List the limitations involved and solutions to overcome these limitations.
05	Estimation of Length of Raw material required for a forged bolt and Calculate the Production Cost considering direct and Indirect expenses.

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Manufacturing Processes	Test	I/II/III	Sem	III/IV
Course Code	20ME33P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels	Course Outcome	Marks

I	1			
	2			
II	3			
	4			
III	5			
	6			
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.				

5. (a) For CIE Skill Test - 4

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	Question on Casting Process With Process plan, Costing of the product for a Given parameters including pattern, melting and other expenses <ul style="list-style-type: none"> • Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks • Preparation of Mold by using Pattern=25 Marks • Costing including Raw material ,process and finding Total cost , selling Price =25 Marks • Operation performed =20 marks • Dimensional accuracy = 05 Marks 	90
2	01	Portfolio evaluation based on the average of all Practice Sessions (1-6 weeks)	10
Total Marks			100

5. (b) For CIE Skill Test -5

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	Question on Forging operation with Process plan, Calculation of Raw material Length, Costing of the product for a Given parameters considering all Possible Losses. <ul style="list-style-type: none"> • Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks • Costing including Raw material length ,process time and finding Total cost , selling Price = 25 marks • Operations Performed with Dimensional accuracy= 20Marks. 	60
2	03	One Skill oriented Question on Sheet Metal work <ul style="list-style-type: none"> • Development for a given drawing =20 Marks • Sheet metal Operation with Dimensional accuracy =10 marks 	30
3	02,03	Portfolio evaluation based on the average of all Practice Sessions (7-12 weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6

3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
		Average Marks= (8+6+2+2)/4=4.5					5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Elements of Workshop Technology (Vols. 1 and II) by Hajra Chaudhary
2	Production Technology By R.K. Jain
3	Foundry Technology By O.P.Khanna
4	Engineering Drawing Vol-2 By K.R.Gopala Krishna
5	Engineering Drawing By N.D.Bhat

8. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01,02	<p>One Skill oriented Question on Casting</p> <ul style="list-style-type: none"> Process plan including Component Drawing ,process list and Tool/Equipment's selection= 15 marks Preparation of Mold by using Pattern=30Marks Other Operations performed =10 marks <p style="text-align: center;">OR</p> <p>One Skill oriented Question on Forging operation with Process plan, Calculation of Raw material Length, Costing of the product for the Given parameters considering all Possible Losses.</p> <ul style="list-style-type: none"> Process plan including Component Drawing ,process list and Tool/Equipment's selection= 20 marks Costing including Raw material length ,process time and finding Total cost , selling Price =25marks Operations Performed with Dimensional accuracy=10 Marks. 	55
2	03	<p>One Skill oriented Question on Sheet Metal work</p> <ul style="list-style-type: none"> Development of product=15 Marks Performance and Operation with Dimensional accuracy =10 marks 	25
4	01,02,03,04	Viva voce	20
		Total Marks	100

9. Equipment list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Moulding box	300*300*100mm	20
02	Moulding Rammer	Standard size	20
03	Moulding tool kit	Standard size	20
04	Electric furnace for melting (Wax/Low melting point metal with crucible and ladder for pouring)	Standard size	04
05	Portable grinder for cleaning of casting	Standard size	02
06	Sand Blaster	Standard size	04
07	Ball peen Hammer	½ lb	05
08	Pattern Making Tool kit	Standard size	10
09	Anvil For Forging	Standard size	05
10	Sledge hammer	2 LB	10

11	Hand hammer	1 lb	10
12	Flatteners	Standard size	20
13	Flat Tongs	Standard size	20
14	Round Tongs	Standard size	20
15	Steel scale	300mm	20
16	G I Bucket for Quenching	15 lts capacity	10
17	Open Heart Furnace with stand and Blower	Standard size	04
18	Hot Chisel	24mm size	10
19	Sheet shearing Machine(Manual or M/c type)	Standard size	04
20	Sniper for cutting sheet	Standard size	20
21	Metal stake	Standard size	10
22	Wooden mallet	Standard size	20
23	Plastic Hammer	Standard size	20
24	Bench vice for Bending of sheet	Standard size	05
25	Brazing Gun	Standard size	10



Government of Karnataka

Programme	Mechanical Engineering	Semester	III
Course Code	20ME34P	Type of Course	Programme Core
Course Name	Fluid Power Engineering	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

1. Rationale: Fluid power is one of the basic building blocks of modern automation and is most widely used system to convert fluid energy into useful work through the use of pump, compressor, control valves, actuators and other controlling elements. This technology is used to power a range of items such as tools, construction equipment and machineries, automotive and machineries in manufacturing sectors. Fluid power engineering involves study of properties of fluids, laws governing flow of fluids, working principles of fluid machineries and knowledge of control of machine movements. This course allows the students to develop the knowledge and understanding of the operational requirements of fluid power system and be able to recognise circuit components and build the circuits for applications needed in daily life

2. Course Outcomes: At the end of this course, student will be able to

CO-01	Measure fluid discharge through Channels and Pipes using instruments and estimate the size of the pipe needed for a given population size.
CO-02	Select the right hydraulic machinery to be used in a specific application for a given head and discharge.
CO-03	List the various components and its use in a given fluid power system.
CO-04	Build a simple fluid power system for a given application

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01,04	1. Explain classification and Properties of fluids- Units- Conversion of Cubic meters- Liters – Gallons -TMC 2. Explain Pascal Law, Equation of continuity, Concept of Total Energy 3. Explain Bernoulli's equation and its Applications- Venturi meter, Pitot tube, Orifice meter	Ref Table 1	1.Find Discharge of a fluid through Venturimeter
2	01	01,04	1. Explain Discharge through Rectangular Notch -Numerical Problems 2.Explain Discharge through V- notch - Numerical Problem 3. Explain Flow through Pipes- Major and Minor Losses	Ref Table 1	1. Finding Discharge through Rectangular Notch 2. Finding Discharge through V- Notch

3	01	01,04	1. Determine co-efficient of friction by using Chezy's and Darcy's formulae 2. Design a Pipe for a given number of Inhabitants 3. Design a Pipe for a given discharge	Ref Table 1	1. Finding Co-efficient of Friction in Pipes 2. You tube presentation on fluid flow through pipes and notches
4	02	01,02,04	1. Classification of Pumps 2. Explain the Working Principle of Centrifugal Pump and its Application 3. Explain the Working Principle of Monoblock and its Application	Ref Table 1	1. Find the discharge through Centrifugal Pump 2. Servicing and Repair of Centrifugal Pumps
5	03	01,02,04	1. Explain the Working Principle of Submersible pump and its application 2. Explain the Working Principle of Reciprocating pump and its application 3. Select a suitable Pump for a given Application	Ref Table 1	Servicing and Repair of Submersible pumps
6	02	01,04	1. Classification of Hydraulic Turbines 2. Select a suitable Turbine for a given Head 3. Explain the Working Principle of Impulse Turbine and its Application	Ref Table 1	Determine Performance of Pelton wheel
7	02	01	1. Explain the Working Principle of Reaction Turbine and its Application 2. Explain the Importance of Draft tube, Penstock and Surge Tank 3. Video on Hydraulic Power Plant	Ref Table 1	Video on fluid flow from source to End application Eg: Oil Refineries, Hydraulic Power plant, Water distribution through pipe lines
8	03	01	Identify the basic components of Fluid power Systems with Symbols and Application <ul style="list-style-type: none"> • Air compressor • Air Drier • FRL Unit • Gear Pump • Pressure control Valve- Pressure Reducing Valve, Pressure Intensifier • Direction control Valves - 3/2 , 5/2, 4/2 • Flow control Valve • Needle Valve • Check Valve • Shuttle Valve • Quick Exhaust Valve • Time Delay Valve 	Ref Table 1	Video on Working principles of components used in Fluid Power Systems
9	03	01	<ul style="list-style-type: none"> • Explain Valve Actuating mechanisms - Spring, Lever, Push button, Solenoid • Explain the role of Accumulators in fluid power systems. • Explain working principle of Actuators- Single Acting, Double acting Air Cylinders, Air Motors 	Ref Table 1	Video on Working principles of components used in Fluid Power Systems

			<ul style="list-style-type: none"> • Explain the importance of Seals and Packages 		
10	04	01,04	<ul style="list-style-type: none"> • Build a Fluid Power circuit to Control Speed of a Single Acting cylinder • Build a Fluid Power circuit to Control Speed of a Double Acting cylinder • Build a Fluid Power circuit for Pilot control Double Acting Cylinder 	Ref Table 1	Execute the circuit Practiced in the Class using Trainer Kit or Simulation Software
11	04	01,04,07	<ul style="list-style-type: none"> • Build a Fluid Power circuit for double Acting Cylinder being controlled by 4/2 DC Solenoid Operated Valve • Build a Circuit for Stamping operation by using 3/2 DC Valve with Single Acting Cylinder • Build a Circuit for Automatic Opening and Closing of Door by /using double Acting Cylinder being controlled by 4/2 DC Valve 	Study the latest technological changes in this course and present the impact of these changes on industry	Execute minimum 2 Circuits Practiced in the Class using Trainer Kit or Simulation Software
12	04	01,03,07	<ul style="list-style-type: none"> • Build a Fluid Power circuit for Automatic reciprocating motion of a double acting Cylinder • Build a circuit for feeding a strip with following sequences: Holding the strip, moving the strip forward on to the tool, maintaining the strip in that position and returning the strip to its original position after work is over. • Design a Circuit to press fit a pin to a hole with a precondition that while actuating of the cylinder, both the hands of the operator should be engaged 		Execute minimum 2 Circuits Practiced in the Class using Trainer Kit or Simulation Software
13	04	01,07	<ul style="list-style-type: none"> • Build Circuit for a machine device driven by a single acting cylinder with actuation at least two mutually operated DC valves (Safety circuit with OR and AND Gates) • Build Circuit for the Clamping Device of a Drilling Machine of a Drilling machine such that the clamps are activated before the drill is fed to the Work • Build a Circuit for your Own Application 		Execute minimum 2 Circuits Practiced in the Class using Trainer Kit or Simulation Software, including developing your Own Pneumatic Circuit to perform certain function
Total in hours			39	13	52

- *PO= Program Outcome as listed and defined in year 1 curriculum
- Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	Document and present the application of Pascal's Principle in Real Life by selecting Hydraulic Jack/Hydraulic Brakes/ Hydraulic Lift https://www.studiouguy.com
02	Present a report on possible failures in Submersible Pumps and trouble shoot the same.
03	Discuss and present the application of Pneumatics in farming using case study: Farming in California- The issues and Positivity's
04	Build and Present an Electro-Pneumatic Brake system used in Trains. Also, document Brake Cylinder Pressure effect.
05	Prepare a line Diagram of the pipe line of your Residence or College
06	Prepare a water distribution line diagram from Water reservoir to college
07	Prepare a line diagram for rain water harvesting of your Residence or College
08	Study and prepare a report on water distribution in Dip Irrigation System.

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Manufacturing Processes	Test	I/II/III	Sem	III/IV
Course Code	20ME33P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions	Cognitive Levels	Course Outcome	Marks	
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5. (a)For CIE Skill Test -4

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	One Experimental Question on case related to Application of Bernoulli's theorem (Venturimeter/Orifice/Pitot tube) (Group of 5 Students) <ul style="list-style-type: none"> Writing observations and Tabular column -- 10 Marks Writing Equations required With all notations -- 15 Marks 	45

			<ul style="list-style-type: none"> Conduction of Experiment --- 10 Marks Calculation and Result --- 10 Marks 	
2		01	One Experimental Question on Channels/ Pipes (Group of 5 Students) <ul style="list-style-type: none"> Writing observations and Tabular column -- 10 Marks Writing Equations required With all notations -- 15 Marks Conduction of Experiment --- 10 Marks Calculation and Result --- 10 Marks 	45
3		01	Portfolio evaluation based on the average of all Practice Sessions (1-6 Weeks)	10
Total Marks				100

5. (b) For CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	03,04	Two Skill based Question to Design a Pneumatic Circuit for the given case (Individual Experiment) = 45 Marks each <ul style="list-style-type: none"> Writing Circuit Diagram with all components-25 marks Building Circuit on the Kit -10marks Showing the Result/output - 10 Marks 	90
2	03,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 Weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Bansal. R.K., "Fluid Mechanics and Hydraulics Machines", 9th Edition, Laxmi Publications Private Limited, New Delhi. 2011.
2	R.S.Khurmi, "Fluid Mechanics and Machinery", S.Chand and Company, 2nd Edition, 2007.
3	Hydraulics & Pneumatics – Andrew Parr, Jaico Publishing House New Delhi.
4	Hydraulic and Pneumatic Controls Understanding Made Easy- K.S.Sundaram,- S.chand Company Delhi
5	Ramamrutham. S, "Fluid Mechanics, Hydraulics and Fluid Machines", Dhanpat Rai & Sons, Delhi, 2004.
6	P. N Modi and S. M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulics Machines", 19th Edition, Standard Book House, 2013

7	Hydraulic and Pneumatic Controls- Srinivasan, R.- Vijay Nicole Imprints Private Limited, 2/e, 2008
8	Pneumatic And Pneumatics Controls -Understanding Made Easy - K.S.Sundaram,-S.chand Company Delhi
9	Pneumatic Systems - Majumdar, S.R. -Tata McGraw-Hill Publication, 3/e, 2013

8. LIST OF SOFTWARES/ LEARNING WEBSITES:

1. www.youtube.com/watch?v=VyR8aeioQrU
2. http://www.youtube.com/watch?v=R6_q5gxf4vs
3. www.howstuffworks.com
4. <http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/machine/ui/TOC.htm>
5. https://www.youtube.com/watch?v=F_70hKUYV5c&list=PLE17B519F3ACF9376
6. <https://www.youtube.com/watch?v=zOJ6gWDMTfE&list=PLC242EBB626D5FFB5>
7. <http://www.youtube.com/watch?v=0p03UTgpnDU>
8. <http://www.youtube.com/watch?v=A3ormYVZMXE>
9. <http://www.youtube.com/watch?v=TjzKpke0nSU>
10. <http://www.youtube.com/watch?v=vl7GteLxgdQ>
11. <http://www.youtube.com/watch?v=cIdMNOysMGI>
12. www.boschrexroth.co.in
13. <http://www.automationstudio.com/>
14. <http://www.howstuffworks.com/search.php?terms=hydraulics>
15. <http://hyperphysics.phy-astr.gsu.edu/hbase/fluid.html#flucon>
16. <http://www.youtube.com/watch?v=FVR7AC8ExIM>
17. <http://www.youtube.com/watch?v=iOXRoYHdCV0>
18. <http://www.youtube.com/watch?v=qDinpuq4T0U>
19. <http://www.youtube.com/watch?v=xxoAm3X4iw0>
20. www.festo.com
21. www.boschrexroth.co.in
22. www.nptel.iitm.ac.in
23. <http://www.howstuffworks.com/search.php?terms=pneumatics>

9. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	<p>One Experimental Question on case related to Application of Bernoulli's theorem (Venturimeter/Orifice/Pitot tube) (Group of 5 Students)</p> <ul style="list-style-type: none"> • Writing observations and Tabular column -- 10 Marks • Writing Equations required With all notations --15 Marks • Conduction of Experiment --- 10 Marks • Calculation and Result --- 1 5 Marks <p style="text-align: center;">OR</p> <p>One Experimental Question on Channels/Pipes (Group of 5 Students)</p> <ul style="list-style-type: none"> • Writing observations and Tabular column -- 10 Marks • Writing Equations required With all notations --1 5 Marks • Conduction of Experiment --- 10 Marks • Calculation and Result --- 1 5 Marks 	50
2	03,04	One Skill based Question to Design a Pneumatic Circuit for the given case (Individual Experiment)	30

		<ul style="list-style-type: none"> • Writing Circuit Diagram with all components-20 marks • Building Circuit on the Kit and Result -10 marks 	
3	CO1,CO2,CO3,CO4	Viva voce	20
	Total Marks		100

10 Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Bench mounted Test Rig for Venturi meter	-----	01
02	Bench mounted Test Rig for Notches	.....	01
03	Bench mounted Test Rig for Friction through pipes	.....	01
04	Centrifugal Pumps FOR Maintenance and Servicing	Used one	02
05	Mano block Pumps FOR Maintenance and Servicing	.....do.....	02
06	Submersible Pumps FOR Maintenance and Servicing	.....do.....	02
07	Pneumatics Trainer Kit with all standard accessories.	Standard size	
08	Compressor for Pneumatics Trainer Kit	6 Bar pressure Single phase 50 Hz	01
09	Hose pipes for Pneumatics Trainer Kit	.....	.....
10	Bench mounted Test Rig for Pelton wheel	Standard size	01

ಮೂರನೇ ಸೆಮಿಸ್ಟರ್

ಕನ್ನಡ ಬಲ್ಲ ಡಿಪ್ಲೋಮಾ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ

(ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಪರಂಪರೆ ಕುರಿತು)

Course Code	20KA31T	Semester : III	Course Group - AU
Course Title	ಸಾಹಿತ್ಯ ಸಿಂಚನ - 2	Category : Audit	Lecture Course
No. of Credits	2	Type of Course	CIE Marks : 50
Total Contact Hours	02 Hrs Per Week 26 Hrs Per Semester	Prerequisites Teaching Scheme (L:T:P)= 2:0:0	SEE Marks : Nil

ಸಾಹಿತ್ಯ ಸಿಂಚನ - 2 ಪಠ್ಯಕ್ರಮ - 20KA31T

26 ಗಂಟೆಗಳು

ಪಠ್ಯಕ್ರಮದ ಪರಿವಿಡಿ	ಬೋಧನಾ ಅವಧಿ
1. ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಪ್ರಭಾವಗಳು ಮತ್ತು ಪ್ರೇರಣೆಗಳು	01 ಗಂಟೆ
2. ಹೊಸಗನ್ನಡ ಕಾವ್ಯದ ಪ್ರಕಾರಗಳು -	02 ಗಂಟೆ
<ul style="list-style-type: none"> ನವೋದಯ ಸಾಹಿತ್ಯ - ಲಕ್ಷಣಗಳು ಮತ್ತು ಪ್ರೇರಣೆ, ಪ್ರಮುಖ ಕವಿಗಳು ಮತ್ತು ಸಾಹಿತ್ಯದ ಕೊಡುಗೆಗಳು. 	03 ಗಂಟೆ
<ul style="list-style-type: none"> ನವ್ಯ ಸಾಹಿತ್ಯ - ಲಕ್ಷಣಗಳು ಮತ್ತು ಪ್ರೇರಣೆ, ಪ್ರಮುಖ ಕವಿಗಳು ಮತ್ತು ಸಾಹಿತ್ಯದ ಕೊಡುಗೆಗಳು. 	03 ಗಂಟೆ
<ul style="list-style-type: none"> ಬಂಡಾಯ ಮತ್ತು ಪ್ರಗತಿಪರ ಸಾಹಿತ್ಯ - ಲಕ್ಷಣಗಳು ಮತ್ತು ಪ್ರೇರಣೆ, ಪ್ರಮುಖ ಕವಿಗಳು ಮತ್ತು ಸಾಹಿತ್ಯದ ಕೊಡುಗೆಗಳು. 	03 ಗಂಟೆ
<ul style="list-style-type: none"> ದಲಿತ ಸಾಹಿತ್ಯ, ಮಹಿಳಾ ಸಾಹಿತ್ಯ, ವಿಜ್ಞಾನ ಸಾಹಿತ್ಯ ಮತ್ತು ಇತ್ತೀಚಿನ ಪ್ರಚಲಿತ ಕನ್ನಡ ಸಾಹಿತ್ಯ - ಲಕ್ಷಣಗಳು ಮತ್ತು ಪ್ರೇರಣೆ, ಪ್ರಮುಖ ಕವಿಗಳು ಮತ್ತು ಸಾಹಿತ್ಯದ ಕೊಡುಗೆಗಳು. 	03 ಗಂಟೆ
3. ವೈಚಾರಿಕತೆ ಕುರಿತಾದ ಲೇಖನ - ಜಿ ಎಸ್. ಶಿವರುದ್ರಪ್ಪ	01 ಗಂಟೆ
4. ಕಥೆ - ನೇಮಿಚಂದ್ರ	01 ಗಂಟೆ
5. ಪ್ರವಾಸ ಕಥನ - ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯರವರ (ಕುಪ್ಪಳಿ ಡೈರಿ ಪುಸ್ತಕದಿಂದ)	01 ಗಂಟೆ
6. ಪರಿಸರ, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಕುರಿತಾದ ಲೇಖನಗಳು	01 ಗಂಟೆ
7. ಪ್ರಬಂಧ - ಗೊರೂರು ರಾಮಸ್ವಾಮಿ ಅಯ್ಯಂಗಾರ	01 ಗಂಟೆ
8. ಪ್ರಚಲಿತ ವಿದ್ಯಮಾನಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನ - "ಪೇರು ಮಾರುಕಟ್ಟೆ ಮತ್ತು ಹಣಕಾಸು ನಿರ್ವಹಣೆ" ಕುರಿತಂತೆ	01 ಗಂಟೆ
9. ಕರ್ನಾಟಕ ಏಕೀಕರಣ ಚಳುವಳಿ - ಪ್ರೊ. ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ	01 ಗಂಟೆ
10. ಕನ್ನಡ ಸಿನಿಮಾರಂಗ ಬೆಳೆದು ಬಂದ ದಾರಿ ಮತ್ತು ನಾಡು-ನುಡಿ ಹಾಗೂ ನಾಡಿನ ಸಂಸ್ಕೃತಿಯ ಮೇಲೆ ಬೀರಿದ ಪ್ರಭಾವಗಳು	01 ಗಂಟೆ
11. ಕನ್ನಡದ ಸಾಮಾಜಿಕ ಉಪಭಾಷೆಗಳು (ಭಾಷಾ ಪ್ರಭೇದಗಳು)	01 ಗಂಟೆ
12. ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಒಂದು ಅವಲೋಕನ	02 ಗಂಟೆ
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ 26 ಗಂಟೆಗಳು	26 ಗಂಟೆ

**ಕನ್ನಡ ಬಾರದ / ಕನ್ನಡೇತರ ಡಿಪ್ಲೋಮಾ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕನ್ನಡ ಕಲಿಸಲು
ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ**

Course Code	20KA31T	Semester : III	Course Group - AU
Course Title	ಬಳಕೆ ಕನ್ನಡ - 2	Category : Audit	Lecture Course
No. of Credits	2	Type of Course	CIE Marks : 50
Total Contact Hours	2 Hrs Per Week 26Hrs Per Semester	Prerequisites Teaching Scheme (L:T:P)= 2:0:0	SEE Marks : Nil

ಬಳಕೆ ಕನ್ನಡ - 2 ಪಠ್ಯಕ್ರಮ - 20KA31T

Table of Contents (ಪರಿವಿಡಿ)

26 ಗಂಟೆಗಳು

Part – 1	Teaching Hour
Necessity of learning a local language (Continuation). Tips to learn the language with easy methods (Continuation). Easy learning of a Kannada Language: A few tips (Continuation). Hints for correct and polite conversation (Continuation). Instructions to Teachers for Listening and Speaking Activities (Continuation). Instructions to Teachers for Reading and Writing Activities (Continuation).	01 Hour
Part – II	
Key to Transcription for Correct Pronunciation of Kannada Language (Continuation). Instructions to Teachers to teach Kannada Language (Continuation).	02 Hour
Part – III Lessons to teach Kannada Language (Speaking, Listening, Reading and Writing Activities with Explanation)	
Lesson – 1 Personal Pronouns, Possessive Forms, Interrogative words – Part II	02 Hour
Lesson – 2 Permission, Commands, encouraging and Urging words (Imperative words and sentences) – Part II	02 Hour
Lesson – 3 Comparative, Relationship, Identification and Negation Words – Part II	02 Hour
Lesson – 4 Different types of forms of Tense (Use and Usage of Tense in Kannada) – Part II	02 Hour
Lesson – 5 Kannada Helping Verbs in Conversation (Use and Usage of Verbs) – Part II	02 Hour
Lesson – 6 Formation of Past, Future and Present Tense Sentences with Changing Verb Forms	02 Hour
Lesson – 7 Karnataka State and General Information about the State	02 Hour
Lesson – 8 Kannada Language and Literature	02 Hour
Lesson – 9 Do's and Don'ts in Learning a Language	02 Hour
PART - IV Reading and writing Practice of Kannada Language	
Lesson – 10 Kannada Language Script Part – I	02 Hour
Lesson – 11 Kannada Language Script Part – II (Continuation)	02 Hour
Lesson – 12 Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation (Continuation).	01 Hour
Total Teaching Hours	26 Hour

**ಸಾಹಿತ್ಯ ಸಿಂಚನ ಭಾಗ - II ಮತ್ತು ಬಳಕೆ ಕನ್ನಡ ಭಾಗ - II ಈ ಎರಡು ಪಠ್ಯಕ್ರಮಗಳಿಗೆ
CIE - ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಮಾರ್ಗಸೂಚಿಗಳು :**

(Course Assessment and Evaluation Chart - CIE only)

Sl. No	Assessment	Type	Time frame in semester	Duration In minutes	Max marks	Conversion
1.	CIE- Assessment - 1	Written Test - 1	At the end of 3 rd week	80	30	Average of three written tests : 1, 2 & 3 for 30 Marks
2.	CIE- Assessment - 2	Written Test - 2	At the end of 7 th week	80	30	
3	CIE- Assessment - 3	Written Test - 3	At the end of 13 th week	80	30	
4.	CIE- Assessment - 4	MCQ/Quiz	At the end of 5 th week	60	20	Average of three Assessment tests : 4, 5 & 6 for 20 Marks
5	CIE- Assessment - 5	Open Book Test	At the end of 9 th week	60	20	
6	CIE- Assessment - 6	Work book Consolidation & Activities	At the end of 11 th week	60 (Work book Submission)	20	
Total CIE – Continuous Internal Evaluation Assessment Marks						50
Total Marks						50

- ಸೂಚನೆ :**
- 1.CIE - ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ 1, 2 ಮತ್ತು 3 ರ ಕಿರು ಪರೀಕ್ಷೆಗಳನ್ನು ಮತ್ತು ಮೌಲ್ಯಮಾಪನದ 4, 5 ಮತ್ತು 6 ರ ಪರೀಕ್ಷೆಗಳನ್ನು ಪ್ರತ್ಯೇಕ ಬ್ಲಾಬುಕ್ ಪುಸ್ತಕದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳು ಬರೆಯಬೇಕು.
 - 2.ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳು, ತರಗತಿ ಕನ್ನಡ ಭಾಷಾ ಶಿಕ್ಷಕರಿಂದ ಮತ್ತು ವಿಭಾಗಾಧಿಕಾರಿಗಳಿಂದ ದೃಢೀಕರಣಗೊಂಡ ಕಾರ್ಯಪಠ್ಯಪುಸ್ತಕವನ್ನು (Work Book) ಮೌಲ್ಯಮಾಪನ ಭಾಗ- CIE- Assessment – 6 ರ ಪರೀಕ್ಷೆಯ ನಂತರ ಆಯಾ ವಿಭಾಗಕ್ಕೆ ಸಲ್ಲಿಸಬೇಕು.

4TH SEMESTER



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	IV
Course Code	20ME41P	Type of Course	Programme Core
Course Name	Operations Management	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: The success of any organisation not only depends on quality of its products and services but also depends on the people within it. Thus, an operational manager has to play a prominent role in an organisation with human capital and machines. Therefore, managerial skills are essential for enhancing their employability and carrier growth. This course is therefore designed to provide basic concepts in operations management, forecasting techniques, capacity planning, aggregate planning, master production schedule, quality, and inventory and supply chain management for effective utilisation of resources and competitive advantage through operational excellence

2. Course Outcomes: On Completion of course, the student will be able to:

CO-01	Prepare a production capacity utilization plan based on demand forecast and available production capacity for a given product.
CO-02	Prepare a master production plan based on a production capacity utilization plan and a material management plan for a given product.
CO-03	Prepare a process plan using time study, motion study and other appropriate methods to ensure process efficiency.
CO-04	Prepare a quality assurance plan based on a given quality model which is suitable for either a product or a service organisation.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01	Introduction to Operation Management 1. Introduction to Operation Management - Operation Functions	Ref Table 1	<ul style="list-style-type: none"> •Virtual Tour Organization (You tube) •Problems on Productivity
			2. Evolutions and Historical Events in Operational Management		
			3. Productivity and Competitiveness, Strategy and operation		
2	01	01	DEMAND FORECASTING 1.Demand Forecasting- Demand Behavior-Trend Cycle - Seasonal Background - Steps in Forecasting Process	Ref Table 1	Problems on <ul style="list-style-type: none"> •Qualitative Forecast - Delphi method, Market Research method •Quantitative Forecast - Time series Method a) Moving average (Naive forecast , Simple moving
			2. Short range and Long Range Forecast		
			3. Qualitative Forecast methods		

					Average, Weighted moving Average)
3	01	01	1. Quantitative Forecast methods	Ref Table 1	Problems on b) Exponential smoothing
			2. Seasonal Adjustments		
			3. Forecast Accuracy		
4	01	01	CAPACITY AND AGGREGATE PLANNING 1. Need for Capacity Planning – Capacity expansion Strategies – Capacity planning Models.	Ref Table 1	Problems on •Capacity Planning, •Aggregate planning •Master production Schedule
			2. Aggregate planning- Methods		
			3. Master production Schedule		
5	01	01	PROCESS PLANNING 1. Make or Buy Decision Outsourcing- Factors for Outsourcing decision- Process Selection – Batch , Mass ,Continuous	Ref Table 1	•Virtual Tour on Batch, Mass and continuous Process •Develop an Operation Sheet indicating Process Plan and Process flow chart for a given component.
			Components of e-manufacturing		
6	03	01	1.Motion Study	Ref Table 1	•Develop Job Process chart with Process Symbols for a given Process. •Develop Man- Machine chart for a given Process. •Case study on Time Study Principles for a given process.
			2. Man- Machine chart		
			3. Concepts on Time Study		
7	02	01	INVENTORY MANAGEMENT 1. Elements of Inventory Management- Inventory Costs- Carrying, Ordering and Shortage Costs	Ref Table 1	Problems on •ABC Classification System •Economic Order Quantity Models •The Production Quantity Model
			2.Inventory Control Systems- Continuous Inventory System (Fixed-Order-Quantity System) Periodic Inventory System (Fixed-Time-Period System)		
			3. Concept on ABC Classification, Economic Order Quantity Models, Production Quantity Model		
8	02	01,02	1. Order Quantity for A Periodic Inventory System Order Quantity with Variable Demand	Ref Table 1	Case study on JIT (Eg:Toyoto Production System)
			2. JIT -Pull System		
			3 Kanban's System		
9	02	01	Supply Chain Management 1.Supply Chains Supply Chains for Service Providers	Ref Table 1	Study on •The Bullwhip Effect •Risk Pooling •Green Supply Chains
			2.Value Chains The Management of Supply Chains		
			3.Vendor Selection- Vendor		

			evaluation and Vendor Development, Negotiations		
10	02	01	1.Supply Chain Uncertainty and Inventory	Ref Table 1	Study on •Information Technology: Supply Chain Enabler •Bar Codes •Radio Frequency Identification •Build-To-Order (BTO)
			2.E-Business, Electronic Data Interchange		
			3.Supply Chain Integration- Collaborative Planning, Forecasting, And Replenishment		
11	02	01,07	1.Material Requirements Planning (MRP) Enterprise Resource Planning (ERP),	Study the latest technological changes in this course and present the impact of these changes on industry	Case study on Procurement- Outsourcing. •E-Procurement •E-Market places •ERP MODULES
			2. Warehouse Management Systems Collaborative Logistics, Distribution Outsourcing		
			3.Finance/Accounting- Sales/Marketing- Production/Materials Management- Human Resources		
12	04	01,04,07	QUALITY MANAGEMENT 1. Quality from The Customer’s Perspective Dimensions of Quality for Manufactured Products Dimensions of Quality for Services		Practice on Quality Tools •Process Flowcharts •5 Whys, Cause-And- Effect Diagrams •Check sheets And Histograms •Pareto Analysis •Scatter Diagrams
			2. Quality from The Producer’s Perspective A Final Perspective On Quality The Cost of Quality The Cost of Achieving Good Quality		
			3. The Cost of Poor Quality The Quality–Productivity Ratio Quality Management System		
13	04	04,05,07	1. TQM and QMS The Focus of Quality Management— Customers		Practice on The Deming Wheel (PDCA Cycle) •Process Control Charts •Statistical Quality Control •ISO 9000 •ISO14000
			2. Quality Management in The Supply Chain The Role of Employees in Quality Improvement Kaizen and Continuous Improvement Quality Circles		
			3. Process Improvement Teams Six Sigma The Breakthrough Strategy: DMAIC		
Total in hours			39	13	52

- *PO= Program Outcome as listed and defined in year 1 curriculum
- Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials						
01	Below are monthly sales of light bulbs from the lighting store.						
		Jan	Feb	March	April	May	June
	MONTH						
	SALES	50	200	80	40	360	
	Forecast sales for June using the following						
	<ul style="list-style-type: none">• Naive method• Three- month simple moving average• Three-month weighted moving average using weights of 0.5, 0.3 and 0.2• Exponential smoothing using an alpha of 0.2 and a May forecast of 350.						
02	Delph Manufacturing Company is going to purchase an auto parts component from one of two competing suppliers. Delph is going to base its decision, in part, on the supply chain performance of the two suppliers. The company has obtained the following data for average raw materials, work-in-process, and finished goods inventory value, as well as cost of goods sold for the suppliers						
	Items		Supplier 1		Supplier 2		
	Cost of goods sold		Rs 8,360,000		14,800,000		
	Raw materials		270,000		870,000		
	Work-In-Progress		62,000		550,000		
	Finished goods		33,000		150,000		
	Each company operates 52 weeks per year. Determine which supplier has the best supply chain performance according to inventory turns and weeks of supply. What other factors would the company likely take into account in selecting a supplier?						
03	The maintenance department for a small manufacturing firm has responsibility for maintaining an inventory of spare parts for the machinery it services. The parts inventory, unit cost, and annual usage are as follows						
	Part		Unit Cost(Rs)		Annual Usage		
	1		100		90		
	2		350		40		
	3		30		130		
	4		20		180		
	5		320		50		
	The department manager wants to classify the inventory parts according to the ABC system to determine which stocks of parts should most closely be monitored						
04	The design capacity for engine repair in our company is 80 trucks/day. The effective capacity is 40 engines/day and the actual output is 36 engines/day. Calculate the utilization and efficiency of the operation. If the efficiency for next month is expected to be 82%, what is the expected output?						
05	County school buses are inspected every month for “defects.” In a recent monthly inspection, 27 worn or torn seats were found, 22 buses had dirty floors, there were 14 cases of exterior scratches and chipped paint, there were 8 cracked or broken windows, the engines on 4 buses had trouble starting or were not running smoothly, and 2 buses had faulty brakes. Develop a Pareto chart for the bus inspections and indicate the most significant quality-problem categories. What does this tell you about the limitations of applying Pareto chart analysis? How might these limitations be overcome in Pareto chart analysis						
06	Study and prepare a report on Inventory management in A Super Bazaar						
07	Case study on Supply chain Management in Amazon, Flikart etc						
08	Case study on use of ERP in An Education Institution (From Admission to Award of Degree)						
09	Case study on logistics management in Swiggy, Zomoto, Dunzo etc						

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3.	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5.	CIE-5 Skill Test-Practice	12	180	100	
6.	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Operation Management	Test	I/II/III	Sem	IV
Course Code	20ME41P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions	Cognitive Levels(R/U/A)	Course Outcome	Marks	
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5 . (a) For CIE Skill Test -4

Duration: 240Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	One Question- Problems/Case study on Demand forecasting/Master Scheduling/Capacity Planning	45
2	01,03	Based on the given Case Study, Prepare a Job Process chart with Process Symbols/Develop a Man- Machine chart	45
3	01,03	Portfolio evaluation based on the average of all Practice Sessions (1-6 Weeks)	10
Total Marks			100

5 . (b) For CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	One Question on Inventory Management and Supply Chain Management (JIT/ Kanban System /E- Business/)	45
2	04	For the given case study , Prepare the Cost of achieving good Quality using any quality Tools	45
3	02,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Production and Operations Management – Creating Value along the Supply Chain By Russel and Taylor , Wiley Publications , 7 Edition
2	Modern Production and Operation Management By Buffa and Sarin, Wiley Publications, 8 edition
3	Production and Operations Management By Chary, Tata Mc Graw Hill Publications
4	Production and Operations Management- Concepts, Models and Behaviour By Adam and Ebert, Prentice Hall Publications

8. LIST OF SOFTWARES/ LEARNING WEBSITES:

1. www.youtube.com/watch?v=SF53ZZsP4ik
2. www.youtube.com/watch?v=iPZlQ3Zx5zc

9. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01,02,03	One Question- Problems/Case study on Demand forecasting/Master Scheduling/Capacity Planning OR Based on the given Case Study, Prepare a Job Process chart with Process Symbols/Develop a Man- Machine chart	40
2	03,04	One Theory Question on Inventory Management and Supply Chain Management (JIT/ Kanban System /E- Business/) OR For the given case study , Prepare the Cost of achieving good Quality using any quality Tools	40
3	01,02,03,04	Viva voce	20
	Total Marks		100

10. Tools/ Equipment/ Software's Required

- 1.ERP Software



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	IV
Course Code	20ME42P	Type of Course	Programme Core
Course Name	CNC Programming and Machining	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: In recent years the manufacturing environment has undergone dramatic change. For achieving market goals, it is essential to produce quality parts in less time. Evolution of information technology, variety manufacturing concepts with zero lead time demand and quality consciousness have supported fast adaption of computerized numerical control (CNC) machines. As in human beings' mental ability is becoming more important than physical ability to do the manual work, similarly CNC programming in the same way has more importance along with selection and use of CNC tooling. In this course therefore an attempt has been made to develop skills required for programming, tooling etc for CNC machine. CNC machines normally are not limited to machine tools only but realm of CNC has widened in almost all areas of manufacturing, processes and support activities. It is therefore very important for Diploma mechanical engineers to master CNC technology.

2. Course Outcomes/Skill Sets: At the end of this course, student will be able to:

CO-01	Identify various components of a CNC machine and list the use of those components for any given CNC operation.
CO-02	Study a given production drawing and list the right tools needed to produce a product as per the drawing.
CO-03	Write a CNC turning and milling program for a given production drawing, simulate the program and execute the program in production mode.
CO-04	Develop and/or import a 3-D model of a given component drawing, generate the CNC programming codes using CAM software and execute the program in production mode.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01	1.Introduction to CNC Machines- Advantages of CNC machines over Conventional machines 2.Explain the Construction features of CNC machine- Machine Structure, bed, spindle motor and drive, axes motor and ball screws using Multimedia 3. Explain Guide ways, LM guides, console, control switches, coolant system, hydraulic system using Multimedia	Ref Table 1	1. Demonstrate Personal, Conduct, Shop etiquettes and general safety practices in CNC machine Comply safe handling of CNC machines, tools and Equipment. 2.Demonstration of CNC machine and its parts - bed, spindle motor and drive, axes motor and ball screws, guide ways, LM

					guides, console, control switches, coolant system, hydraulic system, 3. Identification of safety switches, machine over travel limits and emergency stop. Machine starting & operating in Reference Point, JOG and Incremental Modes
2	01,02	01	1.Explain Axis convention of CNC machine 2. Explain Cutting tool materials, cutting tool geometry – insert types, holder types, insert cutting edge geometry. 3. ISO nomenclature for turning tool holders, boring tool holders, indexable inserts. - Tool holders and inserts for radial grooving, face grooving, threading, drilling	Ref Table 1	1.Conduct a preliminary check of the readiness of the CNC machine viz., cleanliness of machine, referencing – zero return, 2.Functioning of lubrication, coolant level, correct working of sub-system
3	01,02	01,04	1.Explain Automatic tool exchanger using Multimedia 2. Explain the importance of Tool length compensation, Tool nose Radius compensation and Tool Wear compensation. 3. Explain Machine Zero and Work Zero	Ref Table 1	1.Perform Work and tool setting: - Job zero/work coordinate system and tool setup and live tool setup 2. CNC machining centre operation in various modes: JOG, EDIT, MDI, SINGLE BLOCK, AUTO 3. Setting the tool offsets, entry of tool nose radius and orientation in CNC console
4	03	01,04	1.Explain Programming sequence and format - Absolute and Incremental System 2.Explain G codes and M codes 3. Explain Linear interpolation and Circular Interpolation	Ref Table 1	1. Geometry Wear Correction. Geometry and wear offset correction in CNC Console 2. Program checking in dry run, single block modes
5.	03	01	1.Explain cutting Parameters – Feed, Speed and depth of cut w.r.t CNC machine as per Catalogue 2. Explain Canned Cycle, Mirroring and Subroutines	Ref Table 1	1.Learn various numerical keys, Address Keys, functional Keys of operational console
6.	03	01,04	Write the Part Program for Facing, Turning, Step turning and Taper turning (Write Program for 3 models and execute any one on the machine)	Ref Table 1	1.Input the Program into the Simulator and operate the Simulator 2.Transfer the simulated Program to machine

					3.Set the machine with necessary tools and Job 4. Execute the Program in Auto mode to produce the Job.
7.	03	01,04	Write the Part Program for Turning, Profile turning and Thread cutting (Write Program for 3 models and execute any one on the machine)	Ref Table 1	1.Input the Program into the Simulator and operate the Simulator 2.Transfer the simulated Program to machine 3.Set the machine with necessary tools and Job 4.Execute the Program in Auto mode to produce the Job
8.	03	01,04	Write a CNC milling program for Pocket machining (Write Program for 3 models and execute any one on the machine)	Ref Table 1	1.Input the Program into the Simulator and operate the Simulator 2.Transfer the simulated Program to machine 3.Set the machine with necessary tools and Job 4.Execute the Program in Auto mode to produce the Job
9	03	01,04	Write a part program for drilling 4 holes in a plate Six holes along PCD on a circular plate	Ref Table 1	1.Input the Program into the Simulator and operate the Simulator 2.Transfer the simulated Program to machine 3.Set the machine with necessary tools and Job 4.Execute the Program in Auto mode to produce the Job
10.	03	01,04,07	Write a Program using Mirroring Write a Program using Subroutines	Ref Table 1	1.Input the Program into the Simulator and operate the Simulator 2.Transfer the simulated Program to machine 3.Set the machine with necessary tools and Job 4.Execute the Program in Auto mode to produce the Job

11	04	01,04,07	Generate the Part Program for Component requiring Turning, Step turning Profile turning and Thread cutting by using CAM software (Program for 3 models and execute any one on the machine)	Study the latest technological changes in this course and present the impact of these changes on industry	1. Transfer the simulated Program to machine 2. Set the machine with necessary tools and Job 3. Execute the Program in Auto mode to produce the Job
12	04	01,04,07	Generate a CNC program for component having Pocket machining using CAM software (Program for 3 models and execute any one on the machine)		1. Transfer the simulated Program to machine 2. Set the machine with necessary tools and Job 3. Execute the Program in Auto mode to produce the Job
13			Demonstrate the manufacturing of following components on CNC machines using YouTube Videos 1. CNC Turning 2. Rollers 3. Spacers 4. Brackets Discuss and Prepare a Report on the videos Presented for each manufactured component		Demonstrate the manufacturing of following components on CNC machines using YouTube Videos 1. Spindles 2. Frames 3. Engine Block 4. Ball Bearings Discuss and Prepare a Report on the videos Presented for each manufactured component
Total in hours			39	13	52

- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	Discuss the steps for choosing the Right CNC machine tool using various parameters like operator experience, Material to be cut, Part difficulty and complexity, LM guides, Control systems, Cost per part, Availability of space. www.hwaeonasia.com
02	Presentation on Macros and Parametric Programming in CNC by discussing basic macro skill- Macro capability, common features and applications- Macro structure www.thomasnet.com
03	Discuss and present a report on influence of coolant in CNC by explaining Purpose- delivery methods of coolants- Types of coolants- Health and safety issues- Properties- Recycling and disposal of cutting lubricants www.Industr.com
04	Each student has to Present minimum 5 CNC Programming on Machining involving Turning, Milling and Drilling. (Course coordinator has to ensure no repetition of the Programs)

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3.	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 201 tests 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Operation Management	Test	I/II/III	Sem	IV
Course Code	20ME41P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions	Cognitive Levels(R/U/A)	Course Outcome	Marks	
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5 . (a) CIE Skill Test -4

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02,04	One Question on Writing CNC program For Turning Model ,Simulation and Preparation of the MODEL on CNC Machine <ul style="list-style-type: none"> Writing CNC program—30 Marks Editing the program—30 Marks Simulation and Preparation of the MODEL on CNC Machine - 30 Marks 	90
2	02,04	Portfolio evaluation based on the average of all Practice Sessions (1-6 Weeks)	10
Total Marks			100

5 . (b) CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
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1	02,03	One Question on Writing CNC program For Milling Model ,Simulation and Preparation of the MODEL on CNC Machine <ul style="list-style-type: none"> • Writing CNC program—25 Marks • Editing the Program—15 Marks • Simulation and Preparation of the MODEL on CNC Machine-10 Marks 	50
2	02,04	One Question on Generating CNC Turning Program/Milling Program, Using CAM Software, Simulation and Preparation of the MODEL on CNC Machine. <ul style="list-style-type: none"> • Preparation of Solid Model for a given Drawing using software - 25 marks • Generate Turning Program/Milling Program, Using CAM Software - 05 Marks • Interface with the CNC machine and produce the model -10 Marks 	40
3	02,03,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 Weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Automation, Production Systems, and Computer- Aided Manufacturing by Mikell P. Groover Prentice-Hall International publication
2	CAD/CAM Principles and Applications P N Rao McGraw Hill Education
3	CNC Machines. Pabla B.S., Adithan M. New Age International, New Delhi, 2014(reprint)
4	Computer Numerical Control-Turning and Machining centers. Quesada Robert Prentice Hall 2014

8. LIST OF SOFTWARES/ LEARNING WEBSITES:

1. <http://www.nptel.ac.in>
2. <http://www.youtube.com/watch?v=M3eX2PKM1RI>
3. <http://www.youtube.com/watch?v=EHQ4QIDqENI&list=PLBkqkLQ02nAt5MNL0>
4. <http://www.youtube.com/watch?v=hJFLcvtiNQI>
5. <http://www.youtube.com/watch?v=BIM1AyxfYkw> .
6. <http://www.mtabindia.com>
7. <http://www.swansoftcncsimulator.com>

9. SEE Scheme of Evaluation

Duration: 180 Min

SL. No.	CO	Particulars/Dimension	Marks
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1	02,03	<p>One Question on Writing CNC program For Turning Model ,Simulation and Preparation of the MODEL on CNC Machine</p> <ul style="list-style-type: none"> • Writing CNC program—30 Marks • Simulation and Preparation of the MODEL on CNC Machine-20Marks <p style="text-align: center;">OR</p> <p>One Question on Writing CNC program For Milling Model ,Simulation and Preparation of the MODEL on CNC Machine</p> <ul style="list-style-type: none"> • Writing CNC program—30 Marks • Simulation and Preparation of the MODEL on CNC Machine-20 Marks 	50
2	02,04	<p>One Question on Preparing a Solid Model and Generating CNC Turning Program/Milling Program, Using CAM Software,</p> <ul style="list-style-type: none"> • Preparation of Solid Model for a given Drawing using software – 20 marks • Generate CNC Turning Program/Milling Program, Using CAM Software - 10Marks 	30
3	01,02,03,04	Viva voce	20
Total Marks			100

10. Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	CNC Turning Centre (Tutor or Productive)	Minimum diameter 25 mm, Length 120 mm with ATC. (Approximate)	01
02	CNC Milling Centre (Tutor or Productive) X axis travel - 225 mm, Y axis travel - 150 mm, Z axis travel - 115 mm, With ATC.(Approximate)	X axis travel - 225 mm, Y axis travel - 150 mm, Z axis travel - 115 mm, With ATC.(Approximate)	01
03	Simulation software likes: CNC Simulator Pro, Swansoft CNC, etc.		20 user
04	Latest version of CAD/CAM integration software like MASTER CAM, NX CAM OR EDGE CAM		20 user
05	Desk top computer	Latest configuration	20 no



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering Diploma	Semester	IV
Course Code	20ME43P	Type of Course	Programme Core
Course Name	Product Design and Development	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: Design department of industry is one of the major job areas for Diploma engineers. The fundamental knowledge of Strength of Materials, Engineering Materials, and Computer Aided Design and Drafting is essential to meet job requirement in this sector. To enable a student to work here, they should know how to design a simple machine element, usual procedures in development of product, fundamental knowledge in design of simple machine elements such as shafts, springs, couplings etc, codes, norms, standards and guidelines for selection of appropriate material. In addition to this, Diploma engineers are required to read and interpret the drawings. Therefore, it is essential that they have competency in preparing drawings of machine parts. This course aims at developing analytical abilities in the student to give solutions to simple engineering design problems using standard procedures. Hence this course has been introduced with the expectations that efforts will be made to provide appropriate learning experiences in the use of basic principles to the design solution for applied problems to develop the required skill and competencies.

2. Course Outcomes/Skill Sets: At the end of the Course, the student will be able to:

CO-01	Explain the key principles of product design considering Strength, Aesthetic and Ergonomic
CO-02	Design simple machine elements like shafts, springs, couplings and knuckle joints using standard data.
CO-03	Prepare CAD Part and Assembly drawings for couplings and knuckle joints based on designed parameter.
CO-04	Produce Component based on designed Parameters using 3- D Printing Techniques

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2hours/batch twice in a week)
1	01	01	Product Development and Design: 1.Explain Product Development- Stages of Product Development- Need and Feasibility study 2.Explain Development of design- Selection of Materials and Process 3.Explain Prototype –launching of product –Product life cycle	Ref Table 1	Discuss case studies of Product development by using Video
2	01	01	General consideration in design: Based on <ul style="list-style-type: none"> Functional requirement Effect on environment Life, Reliability, Safety 	Ref Table 1	Case study

			<ul style="list-style-type: none"> Principles of Standardization Assembly Feasibility Maintenance-Cost-Quantity Legal issues and Patents Aesthetic and Ergonomic factors Choice of Materials Feasibility of Manufacturing Processes 		
3	01	01	Aesthetic and Ergonomic consideration in Design: <ul style="list-style-type: none"> Explain Aesthetic considerations- Basic types of product forms, Designing for appearance, shape, Design features, Materials, Finishes, proportions, Symmetry Contrast etc. Morgan's color code. Ergonomic considerations- Relation between man, machine and environmental factors. Design of displays and controls. 	Ref Table 1	Case Study on Ergonomics and Aesthetic design principles.
4	02	03,04	Torsion of Shaft: <ol style="list-style-type: none"> Assumptions in Shear stress in a shaft subjected to torsion – Strength and Rigidity (Solid and Hollow shaft) Power Transmitted by Solid and Hollow shaft - ASME and BIS Code for power Transmission Problems on Shafts subjected to only Shear based on Rigidity and Strength 	Ref Table 1	1. Validate the Problems on Shafts for Strength and Rigidity using Ansys (One each on Strength and Rigidity)
5	02	03,04	<ol style="list-style-type: none"> Problems on Shafts subjected to only Shear based on Rigidity and Strength Problems on Shaft subjected to only Bending Problems on Shaft subjected to only Bending 	Ref Table 1	1. Recap of CAD commands 2. Practice on Section of Solids- a) Prisms b) Pyramid
6	02	03,04	<ol style="list-style-type: none"> Problems on Shaft subjected to combined Shear and Bending. Problems on Shaft subjected to combined Shear and Bending Problems on Shaft subjected to combined Shear and Bending 	Ref Table 1	1. Practice on Section of Solids- a) Cylinder b) Cone
7	02,03	03,04	Springs: <ol style="list-style-type: none"> Classification of springs- Application of springs- Leaf springs –Application 	Ref Table 1	Sections on Simple Machine Elements (CAD) a) Sectional front view, Front view with

			2.Terminology of Helical spring- Materials and Specification of springs 3. Design of helical spring		Right half in Section, Front view with Left half in Section b) Sectional Top View c) Sectional Side View
8	02,03	03,04	Design of helical spring	Ref Table 1	Sections on Simple Machine Elements (CAD) a) Sectional front view, Front view with Right half in Section, Front view with Left half in Section b) Sectional Top View c) Sectional Side View
9	02,03	03,04	Coupling: Design of Muff coupling	Ref Table 1	Using CAD, prepare Part Models for Muff coupling based on designed parameter and assemble the same. Extract the Sectional views for the above machine element indicating Surface Texture and Bill of Materials
10	02,03	03,04	Design of Protected type Flange Coupling	Ref Table 1	Using CAD, prepare Part Models for Protected type Flange Coupling based on designed parameter and assemble the same. Extract Sectional views for the above machine element indicating Surface Texture and Bill of Materials
11	02,03,	03,04,07	Design of Knuckle Joint		Using CAD, prepare Part Models for Knuckle Joint based on designed parameter and assemble the same. Extract Sectional views for the above machine element indicating Surface Texture and Bill of Materials
12	04	03,04,07	3D Printing 1. Introduction, Process, Classifications, Advantages of		

			additive over conventional Manufacturing, Applications, Modelling for Additive Manufacturing 2. Additive Manufacturing Techniques, 3D Printing Materials and its forms, Post Processing Requirement and Techniques. 3. Product Quality, Inspection and Testing, Defects and their causes, Additive Manufacturing Application Domains	Study the latest technological changes in this course and present the impact of these changes on industry	Preparation of 3D Printer for printing – Modelling, Saving CAD file into STL file, Slicing, Material loading and printing parameter selection
13	04	03,04,07	1. Working of Fused Deposition Modelling (FDM) Machine- Single and Multi Nozzle printers, Machine Configuration- Cartesian, Delta, Polar and robotic arm configuration 3D printers 2. Common FDM materials- PLA, ABS, PA, TPU,PETG, PEEK and PEI, Printer Parameters - Temperature of the nozzle and the platform, the build speed, the layer height, Warping, Layer Adhesion, Support Structure, In-fill & Shell Thickness 3. Benefits & Limitations of FDM, Software Tools- 3D modelling, Slicers & 3D Printer Hosts		Printing of Designed and Modelled component (flange coupling and knuckle joint) on any available 3D printing machine and carryout post processing of additively manufactured product (Inspection and defect analysis).
Total in hours			39	13	52

- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	Presentation on design of Bicycles for Indian children focusing on Aesthetic and Ergonomics by Explaining market analysis- user study – Problem identification – Product design and specification- Concept generation- Material and Manufacturing Processes- Final concept selection www.sastechjournal.com
02	Presentation on types of suspension springs used in Automobile vehicles by explaining leaf-spring, Coil spring , Torsion Spring, Air bags , Rubber Springs www.theengineerspost.com
03	Presentation on different types of Keys used in Transmission system and importance such as parallel key, Saddle key, Sunk Key , Gib headed key, Feather Key, Woorruff Key with Advantages and applications
04	Presentation on Antifriction Bearing by explaining rolling contact- journal ball bearing construction- Cylindrical bearing – Needle bearing – Foot step Bearing – Plumber Bearing

05	Presentation on Friction Clutches used in Automobiles by explaining parts- Single plate- Multi plate- Purpose –Application
06	The Role of Additive Manufacturing in the Era of Industry 4.0
07	Application of Additive Manufacturing in health care industry

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	
6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Production Design and Development	Test	I/II/III	Sem	IV
Course Code	20ME43P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels(R/U/A)	Course Outcome	Marks
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5. (a) For CIE Skill Test -4

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	One Question on Design of Shaft Subjected to Strength and Rigidity <ul style="list-style-type: none"> Fixing the Diameter of Shaft after design ---30 Marks Validate the Designed parameters of Shaft for Strength and Twisting using Ansys- 30 Marks 	60
2	03	One question on Section of Solids (Prism/Pyramid/Cone/Cylinder) <ul style="list-style-type: none"> Placing the Section plane and drawing the section – 20 Marks Extracting the True shape of the Section – 10 Marks 	30
3	01,02,03	Portfolio evaluation based on the average of all Practice Sessions (1-6 Weeks)	10
Total Marks			100

SL. No.	CO	Particulars/Dimension	Marks
1	03,04	One Question on Design and Assembly drawing of Simple Machine parts like Muff Coupling/Flange Coupling/ Knuckle Joint <ul style="list-style-type: none"> Design of Simple Machine part by using Data Hand Book --35 Marks Preparation of Part Models for the Designed values by using CAD Software -- 35 Marks Assembly of Part Models using CAD software With Bill of Materials - -20 Marks 	90
2	03,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 Weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	A Text book of Machine Design R.S. Khurmi & J.K.Gupta S. Chand publication
2	Machine design S G Kulkarni McGraw Hill Education Publications
3	Introduction to Machine design V B Bhandari McGraw Hill Education Publications
4	Design Of Machine Elements Vol I, Vol II J.B.K. Das , P.L.Srinivas Murthy Sapna Publication
5	Machine Component Design William Orthwein Jaico publication
6	Design Data Hand Book for Mechanical Engineers K Mahadevan & K Balaveera Reddy CBS publications
7	Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
8	J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013
9	D.T. Pham and S.S. Dimov, "Rapid manufacturing: The technologies and applications of rapid prototyping and rapid tooling", London-New York, Springer, 2001
10	Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
11	Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
12	CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017

13	L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001
14	Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy", InTech, 2012

8. LIST SOFTWARES/WEBSITES

1. http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/left_home.html
2. http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/left_mod4.html

9. SEE Scheme of Evaluation

Duration: 180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02,03	One Question on Design and Assembly of Simple Machine parts like Muff coupling/Flange Coupling/ Knuckle Joint <ul style="list-style-type: none"> • Design of Simple Machine part by using Data Hand Book -----35 Marks • Preparation of Part Models for the Designed valves By using CAD Software —25 Marks • Assembly of Part Models By using CAD Software With Bill of Materials--- 20 Marks 	80
2	01,02,03,04	Viva voce	20
	Total Marks		100

10. Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	Latest version of CAD software	-----	20 user
02	Desk top computer	Latest configuration	20 no's
03	Laser printer	-----	02 no's
04	3-D Printing Machine		01 no



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	IV
Course Code	20ME44P	Type of Course	Programme Core
Course Name	Elements of Industrial Automation	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: In present scenario, Manufacturing industries are moving towards complete automation. Small and medium industries are in a phase of switching to PLC and SCADA technology for data acquisition and control. Industrial automation systems are used to control and monitor a process, machine or device in a computerized manner that usually fulfils repetitive functions or tasks. They are intended to operate automatically in order to reduce and improve human work in the industry. Advantages of this technology is commonly attributed to higher production rates and increased productivity, more efficient use of materials, better product quality, improved safety, shorter workweeks for labour, and reduced factory lead times. The Automation Engineer will design, program, simulate and commission automated machines and plant-wide processes to perform many job functions. Depending on the size of the organization, the engineer will perform some or all of these responsibilities. Therefore, it is necessary for diploma engineers to have knowledge of both PLC and SCADA technology. This course attempts to provide basic theoretical and practical aspects of automation technologies to develop operational competency. Hence this course is the foundation for diploma engineers who want to further specialise in the field of industrial automation

2. Course Outcomes: At the end of this course, student will be able to

CO-01	Select the right sensor and/or actuator for automating a given application and demonstrate process variables using sensors and/or transducers.
CO-02	Perform specified control functions using a Programmable Logic Controller (PLC) and list various applications of embedded systems.
CO-03	Design and test an automation system for a required operational specification and troubleshoot to resolve any given issue(s).
CO-04	Explain the concepts of SCADA, HMI and DCS and list their various applications

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01	Introduction:	Ref Table 1	Study the following appliances/ automation

			<p>1. Need and benefits of Industrial Automation, Automation Hierarchy, Basic components of automation system, description of each component</p> <p>2. Automation technology as a part of engineering sciences, Key development milestones in the history of automation technology, Effects of automation on people.</p> <p>3. Types of automation system:- Relay logic and PLC</p>		<p>systems and identify various elements used and their function</p> <p>1. Air conditioning System 2. Automatic water level control 3. Elevator(for Three Floor) 4. Washing Machine</p> <p>Write the Block Diagram For each and explain with a Multimedia Presentation</p>
2	01	01	<p>Programmable logic controller:</p> <p>1. Introduction, Compare Relay Logic Control and PLC Logic Control, Internal Architecture of PLC</p> <p>2. I/O Modules (Interfaces), Memory organization.</p> <p>Input devices:</p> <ul style="list-style-type: none"> • Mechanical Switches • Proximity Switches <p>3. Input devices:</p> <ul style="list-style-type: none"> • Photo electric Sensors and Switches • Encoders • Temperature Sensors • Position/Displacement Sensors 	Ref Table 1	<p>Demonstrate the working of below shown Switches/Sensor.</p> <p>a. Various industrial Switches (Push Button, ON/OFF, Toggle, Emergency, Rotary Switches etc.) b. Proximity- Inductive, Capacitive and Optical Sensor c. Temperature Sensor d. Float Sensors</p> <p>Note: Connect each sensor directly to the LED/Lamp with appropriate power supply</p>
3	01	01	<p>1. Input devices:</p> <ul style="list-style-type: none"> • Strain Gauges • Pressure Sensors • Liquid level detectors <p>2. Input devices:</p> <ul style="list-style-type: none"> • Fluid flow measurement • Smart Sensors <p>3. Output Devices:</p> <ul style="list-style-type: none"> • Relay • Directional control Valve 	Ref Table 1	<p>You tube presentation on Input and Output devices</p>

4	01	01	<p>1. ADC and DAC</p> <p>2. Motors- DC motor, Synchronous motor, Servo motor,</p> <p>3. Induction motor, Stepper motor</p>	Ref Table1	<p>Demonstrate the Forward and Reversal of Stepper, Servo and DC Motors with the help of Drivers.</p> <p>Note: Demonstrate the above without using any controllers</p>
5	02	02	<p>PLC Programming:</p> <p>1. Programming standards, List Different PLC Programming, Ladder diagram,</p> <p>2. Standard IEC 1131-3 Symbols used for I/O Devices</p> <p>3. Ladder diagram for logic gates. AND, OR, NOT, NAND, NOR, XOR, XNOR</p>	Ref Table1	<ul style="list-style-type: none"> • Execute energized motor or bulb using Switches in series or Parallel • Write ladder diagram to test digital logic gates and Execute/Simulate the same.
6	02	01	<p>1. Writing Equivalent ladder diagram for Electric Switch, Belt drive , motor circuit</p> <p>Latching, Sequential O/P</p> <p>2. Introduction to Timer functions. Applications of timing functions in process control -- On Delay Timer Function, Off-delay Timer Function</p>	Ref Table 1	<ul style="list-style-type: none"> • There are 3 mixing devices on a processing line A,B ,C. After the process begin mixer-A is to start after 7 seconds elapse, next mixer-B is to start 3.6 second after A. Mixer-C is to start 5 seconds after B. All of them remain ON until a master enable switch is turned off. Develop PLC ladder diagram, timing diagram and simulate the same • Write a Ladder Program to count the number of Items moving

			3. PLC counter functions, Applications of PLC counter function in process control		on a conveyor Belt and Execute/Simulate the same
7	03	02	<p>1) Relay, Jumps and Subroutines</p> <p>2) Develop Ladder Program for relay based motor control automation such that the motor reverses its direction when the limit switches are activated</p> <p>3) Develop a PLC ladder diagram to construct an alarm system which operates as follows.</p> <ul style="list-style-type: none"> - If one input is ON nothing happens. - If any two inputs are ON, a red light goes ON. - If any three inputs are ON, an alarm sirens sound. - If all are ON, the fire department is notified. 	Ref Table 1	<ul style="list-style-type: none"> • Execute the Ladder Program for relay based motor control automation such that the motor reverses its direction when the limit switches are activated and also Demonstrate by interfacing with PLC • Simulate the PLC ladder diagram developed for an alarm system and also Demonstrate by interfacing with PLC
8	03	02	<p>1 & 2) Develop PLC program for the following application</p> <p>a) Traffic Light</p> <p>3) Develop PLC program for the following application</p> <p>b) Water Level Indicator</p>	Ref Table 1	<p>Execute a PLC program for the following applications</p> <p>i) Traffic light controlling</p> <p>ii) Water level controlling</p>
9	03	02	<p>1 & 2) Develop automatic door system using optical sensor and linear actuator</p> <p>3) Develop Automatic Elevator control</p>	Ref Table 1	<ul style="list-style-type: none"> • Execute automatic door system using optical sensor and linear actuator • Design ladder diagram for an Automatic Elevator control <p>Also, Test and simulate the ladder diagram designed to operate and control the</p>

					Automatic Elevator control
10	03	02	<p>1 & 2) Design ladder diagram for car parking. (Hint: car is to be detected and enter the parking space to a particular location if space is available. If there is no space, a lamp should indicate that parking is full)</p> <p>3) Design ladder diagram for operating and controlling the Lift.</p>	Ref Table 1	<ul style="list-style-type: none"> • Simulate a ladder diagram for car parking. • Test and simulate a ladder diagram designed to operate and control the Lift
11	02	02,07	<p>1) Embedded System- Block Diagram of Embedded System</p> <p>2) Applications of Embedded System</p> <ul style="list-style-type: none"> • Robotics Drones • Braking System • Air conditioning, Refrigerator • Engine control System, <p>3) Applications of Embedded System</p> <ul style="list-style-type: none"> • Automatic Washing machine • Microwave Oven • Keyless entry in Automobiles. 	<p>Study the latest technological changes in this course and present the impact of these changes on industry</p>	You tube Presentation on Applications of Embedded System
12	04	01,07	<p>1) Concepts on Distributed control System,</p> <p>2) Concepts on HMI</p> <p>3) Introductions to SCADA</p>		<ul style="list-style-type: none"> • Multi media Exposure to DCS system • Demonstrate the HMI interface to control Light in AND/OR Logic
13	04	01,07	<p>1) Typical SCADA block diagram,</p> <p>2) Benefits of SCADA,</p> <p>3) Applications of SCADA</p>		<ul style="list-style-type: none"> • Multi media Exposure to SCADA system OR • Make case study visiting any nearby industry (Packaging/Milk Dairy/Processing) using HMI, SCADA/DCS systems.

Total in hours	39	13	52
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- ***PO= Program Outcome as listed and defined in year 1 curriculum**
- **Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning**

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials
01	Write a PLC Ladder Program to Switching on/off the Lamp whether they are at the bottom or the top of the staircase.
02	The production line may be powered off accidentally or turned off for noon break. The program is to control the counter to retain the counted number and resume counting after the power is turned ON again. When the daily production reaches 500, the target completed indicator will be ON to remind the operator for keeping a record. Press the Clear button to clear the history records. The counter will start counting from 0 again. Write a PLC Ladder Program to perform this operation.
03	Write a PLC Ladder Program Providing lubricant for the gear box before the lathe spindle starts to run which aims to ensure that the oil pump motor starts first and the main motor starts subsequently.
04	Write a PLC Ladder Program such that Once the photoelectric sensor detects 10 products, the robotic arm will begin to pack up. When the action is completed, the robotic arm and the counter will be reset.
05	Develop PLC Programming Examples on Industrial Automation according to the logic given below, <ul style="list-style-type: none"> • A Saw, Fan and oil pump all go ON when a start button is pressed. • If the saw has operated less than 20s, the oil pump should go off when the saw is turned off and the fan is to run for an additional 5s after the shutdown of the saw. • If the saw has operated for more than 20s, the fan should remain on until reset by a separate fan reset button and the oil pump should remain on for an additional 10 s after the saw is turned off.
06	Develop and Simulate a PLC Ladder Diagram for Bottle Filling Plant
07	Study and present a Report on home Automation
08	Study and present a Report on Embedded systems in Automation
09	Study and present a Report on Automation in Processing Industries

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	

6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Elements of Automation	Test	I/II/III	Sem	IV
Course Code	ZOME44P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels(R/U/A)	Course Outcome	Marks
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5.(a)For CIE Skill Test -4

Duration :240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	Select a suitable Sensor / Switch for a given Process Variable and activate <ul style="list-style-type: none"> Selection of Sensor/Transducer – 05Marks Activation and Result – 15 Marks 	20
2	02	Select a suitable motor for the given case and energize <ul style="list-style-type: none"> Selection of the Motor – 10 Marks Energize and Result – 20 Marks 	30
3	03	Develop and Simulate a simple ladder diagram for a given Case <ul style="list-style-type: none"> Writing Ladder Program – 20 Marks Simulate and Troubleshoot - 20 Marks 	40
4	01,02,03	Portfolio evaluation based on the average of all Practice Sessions (1 -6 Weeks)	10
Total Marks			100

5 . (b) For CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	03	Device and Simulate a ladder diagram for the given Case Study (PLC Based) <ul style="list-style-type: none"> Writing Ladder Program – 40 Marks Simulate and Troubleshoot - 20 Marks 	60
2	04	Prepare a SCADA Block Diagram for the given Case	30
3	03,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 Weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference :

Sl. No.	Description
1	Programmable logic Controllers By W. BOLTON
2	Digital electronics By FLYOD
3	Exploring PLC with applications By PRADEEP KUMAR SRIVATSAVA
4	Automation , Production systems and Computer integrated Manufacturing By MIKELL GROOVER
5	Sensors Hand book-SABRIE SOLOMAN-MC-GRAW HILL publications
6	Hand book of Modern Sensors” Physics ,Designs and Applications- JACOB FRADEN-Springer Publications
7	Electric Motors and Drives BY AUSTIN HUGHES and BILL DRURY

8. LIST OF SOFTWARE/LEARNING WEBSITES

1. <http://www.vlab.com>
2. <http://www.mtabindia.com>
3. <http://www.nptel.ac.in>

9. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	Select a suitable Sensor / Switch for a given Process Variable and activate <ul style="list-style-type: none"> • Selection of Sensor/Transducer – 10 Marks • Activation and Result –20Marks OR Select a suitable motor for the given case and energize <ul style="list-style-type: none"> • Selection of the Motor – 10 Marks • Energize and Result – 20 Marks 	30
3	03	Device and Simulate a ladder diagram for the given Case Study <ul style="list-style-type: none"> • Writing Ladder Program –30 Marks • Simulate and Troubleshoot –20 Marks 	50
4	01,02, 03,04	Viva voce	20
Total Marks			100

10. Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
01	PLC Trainer Kit with the following Modules		05 No

	<ul style="list-style-type: none"> • Door Controller • Car Parking Application • Water Level Controller • Conveyor Controller Application • Lift control Application With different Length Patch Cords		
02	Switches <ul style="list-style-type: none"> • Mechanical Switches • Proximity Switches • Photo electric Sensors and Switches 		05 No each
03	Sensors <ul style="list-style-type: none"> • Temperature Sensors • Position/Displacement Sensors • Strain Gauges • Pressure Sensors • Liquid level detectors • Fluid flow measurement • Smart Sensors • Proximity Sensors 		05 No each
04	Induction Motor with DOL Starter	3 Phase Ac 50 Hz	01
05	Synchronise Motor with DOL Starter	3 Phase Ac 50 Hz	01
06	Stepper Motor	Standard size	01
07	Relays	Standard size	10
08	Counter and Timers	Standard size	10



Government of Karnataka
Department of Collegiate and Technical Education

Programme	Audit Course	Semester	IV
Course Code	20ME45T	Type of Course	Audit
Course Name	Indian Constitution	Contact Hours	2 hours/week 26 hours/semester
Teaching Scheme	L:T:P :: 2:0:0	Credits	2
CIE Marks	50	SEE Marks	Nil

1. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	CO1	Understand Preamble, salient features and importance of Indian Constitution.
CO-02	CO2	Understand Fundamental rights, duties and Directive principles of state policy.
CO-03	CO3	Understand Parliamentary system of governance, Structure, Functions, Power of Central, state governments (Legislative, Executive) and Judiciary.
CO-04	CO4	Understand Panchayat Raj Institutions and Local self-governments, UPSC, KPSC, NHRC, Status of women, RTE etc.

2. Course Content

Week	CO	Detailed Course Content	Contact Hours
1	1	Introduction to constitution of India-Formation and Composition of the Constituent Assembly-Salient features of the Constitution-Preamble to the Indian Constitution	2
2	1,2	Fundamental Rights- Definition, The right to equality, The right to freedom, The right against exploitation, The right to freedom of religion.	2
3	1,2	Cultural and educational rights and The right to constitutional remedies. Fundamental Duties, Directive principles of state policy.	2
4	1,3	Parliamentary system of governance- Structure of Parliament- Lok Sabha and Rajya Sabha. Functions of parliament- Legislative, Executive, Financial Function Powers of Lok Sabha and Rajya Sabha.	2
5	1,3	Procedure followed in parliament in making law, Annual financial statement (Budget) – procedure in parliament with respect to estimates, Appropriation bill, Supplementary, additional grants, Vote on account, votes on credit and exception grant, special provisions, rules of procedure.	2
6	1,3	Structure of union executive, Power and position of President. Vice President, Prime minister and council of ministers.	2
7	1,3	Structure of the judiciary: Jurisdiction and functions of Supreme Court, high court, and subordinate courts.	2
8	1,3	Federalism in the Indian constitution- Division of Powers: Union list, State list and concurrent list. Structure of state legislation, Legislative assembly and Legislative council.	2
9	1,3	Functions of state legislature, Structure of state executive-Powers and positions of Governor, Speaker, Deputy Speaker, Chief Minister and council of minister.	2
10	4	Local self-government- meaning-Three tier system, Village Panchayat-Taluk panchayat Zilla panchayat, Local bodies-Municipalities and Corporations, Bruhath Mahanagara Palike, Functions of Election commission, UPSC, KPSC.	2

11	4	Amendment of the constitution, Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life,	2
12	4	Status of Women in India - Women in rural areas, Constitutional Safeguards - Dowry Prohibition act 1961- Domestic violence act 2005- Sexual harassment at work place bill 2006. Human Rights of Children- Who is a child- list the Rights of the Child- Right to education, Protection of Children from Sexual Offences Act (POCSO)-2012-	2
13	1,4	National Human Rights Commission Constitution- Powers and function of the Commission-Employee rights- Provisions made, Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)-Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trademark	2
Total in Hours			26 Hrs

REFERENCES

1. Introduction to the Constitution of India- Dr. Durga Das Basu
2. Empowerment of rural women in India-Hemalatha H.M and Rameshwari Varma, Hema Prakashana.

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 MCQ	6	60	20	Average of two CIE = 20
5	CIE-5 Open Book Test	12	60	20	
Total CIE Marks					50
Semester End Examination (Practice)			-	-	-
Total Marks					50